The TECHNOLOGY DEPARTMENT

CHEMICAL AGE

VOL LVIII 24 JANUARY 1948 No 1489

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The Basic Principle

of the

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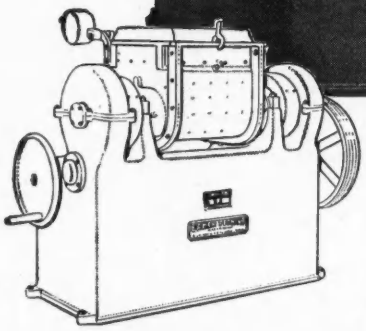
is capable of adaptation to innumerable industrial purposes.



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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Human Values in Industry

IT is a curious fact that 95 per cent of the discussions of technical bodies centre round plant and materials. Industry, however, is primarily a human institution and the means by which human material needs are provided. The merchants, the artificers, the craftsmen of old all took pride in their work in which they expressed themselves. Then a man might be happy because of his craftsmanship; he knew the glow of satisfaction in a job well done. The Indian could spend a lifetime carving one piece of ivory. But with the coming of mechanical power and the machine, a temporary change came upon human society. Greed, always just below the surface, came to the top. Men, women and children were compelled to work for mere starvation wages, and under conditions which made life a burden.

Man, being resilient, strove against this industrial slavery and we are living to-day in the aftermath of that struggle. The pendulum has swung from right to left. We have come to recognise that the machine can no longer be our master and that industry is fundamentally an affair of teamwork, in which some must work with head and some with hand, but all must labour mightily with a common purpose.

There is bound to be both agreement and disagreement in all human relationships. But it is a condition of efficient industrial production at high level that the whole team shall operate as one. The size of industrial units tends to prevent direct and personal relationship between the captain and "other ranks" and in its place some means has to be found of keeping the human being engaged in industry happy and contented. This is true of every rank, from manager to the new apprentice. During the two centuries of industrial history, there has been built up an elaborate mechanism for doing just this. That mechanism is delicate, and must be used properly or it cannot function.

Just how far this team concept can be taken is a matter that is exercising industrial leaders to-day and the conclusion depends very largely on the age and upbringing of the individual. The older generation generally believes that management should be exclusively in the hands of those who have traditionally exercised it. In favour of that view is the undoubted fact that the management of all affairs requires knowledge, skill and experience of a kind not to be found in one manual worker in 10,000, and in only a small proportion of the staff.

On the other hand, it must be conceded that a contented labour force works well, that the conditions under which a man works are of very real importance to him and that he will operate very much more effectively as a member of a team having some say in the conduct of affairs. There is an increasing tendency to allow manual workers and junior staffs a voice in management through representatives properly accredited to committees. Co-partnership in the gas and other industries is one example of the human touch that is helping to lubricate the wheels of industry.

The paramount question however, is to what extent should employees as a body

On Other Pages

exercise control? It is perhaps significant that Russia has returned to management by skilled individuals as against management by popular vote. In this country, the National Coal Board has set up a Colliery Consultative Committee establishing joint control by management and workers and having a model constitution which has the following preamble:—

In a publicly-owned coal-mining industry the concern of managements and workmen should be identical. It is expedient, therefore, to set up a consultative body at each colliery with the object of securing the closest co-operation among all those concerned in the operation of the colliery.

By the terms of reference these committees are the recognised means for the regular consideration of, and the making of recommendations on questions relating to accident and sickness trends at the colliery, and measures for reducing them; colliery welfare arrangements; training and educational activities associated with the colliery. *The technical efficiency of the colliery, for which purpose the committee shall be required to examine weekly output performances in relation to the colliery target and initiate effective measures to improve production in close co-operation with the workpeople and the local trade union lodge.* The development of arrangements designed to secure the active support of the committee's activities by the workmen and the trade union lodge. *The scrutiny of current and future development plans of the colliery and of reports prepared by the colliery manager on mining supplies, e.g., shortages, equipment lost and salvaged*, etc.

These bodies, besides dealing with the welfare of employees, have also a voice in *the technical efficiency* of the colliery and in *current and future development plans* of the colliery. Clearly, they have no voice in the formulation of policy and are advisory only on these issues. The manager is the chairman and on the committee are certain higher officials of the Coal Board and of the unions, with three members of the staff appointed by the manager and six workers elected by secret ballot of the employees.

The wider spread of education has rendered the co-partnership principle a practical proposition. The views of the men and women who do the job are frequently well worth having. *The Observer*, in a recent leading article, went a stage further, asking whether the wage system as a whole is not now out-of-date. It is no longer true that the employers have the sole responsibility for management and the workers have only to "toil and earn." The remedy for the tension and frustration that undoubtedly exists, *The Observer* believes, is to be found "by seeking to change the wage system, with its traditional antagonisms, into a genuine partnership where the workers are remunerated from a share in the proceeds of the enterprise they serve; and where they have not only a share in the proceeds but a share in the ownership and a consultative voice in the management so that they are induced to feel, not by exhortation but by direct experience, that the enterprise is theirs to mar or make." Any tendency of nationalised industries to destroy the co-partnership schemes that private enterprise has instituted thus appears to be against the spirit of the times.

NOTES AND COMMENTS

"Technological Stagnation"

TECHNOLOGICALLY Great Britain is stagnant. That, put very bluntly, as bluntly in fact as it is rendered in the American original, is one of the main conclusions of a 50-pp. report which has been prepared for the Machinery and Allied Products Institute, of Chicago. Chemical industry is included in the findings in this remarkable document, entitled "Technological Stagnation in Great Britain," which may well have derived much of its acidulated flavour from the fact that nearly all the evidence was derived from reports of "working parties" set up by Sir Stafford Cripps in 1945. Bearing in mind that the average conservative English review of industrial prospects would sound in American ears very like a funeral oration, it seems likely that the Chicago observers have overestimated the extent of the decadence brought to light by Sir Stafford Cripps's investigators. There is, however, admittedly some substance in one particular aspect of the indictment, that industrial production per man in England is deplorably low—by American standards. The ratio of individual productivity for British and American industries as a whole, according to the president of the Chicago organisation (Mr. W. J. Kelly), is 1 : 3, and in some industries it is claimed that the average American worker is producing four times as much as his English counterpart. So they say. . .

Second Opinion

THE diagnosis, that this is a severe case of "antiquated equipment and methods," may possibly accord with some of the evidence of the working parties. Whatever the present Minister of Economic Planning might feel about that, he would find it considerably harder to accept the entire American judgment of which the other aspect is provided by a companion report "Anglo-American Commercial Relations" presented at about the same time by the U.S. National Foreign Trade Council. It concludes: "American investors, convinced of the virtues of competitive economic endeavour, can view only with alarm and misgiving the drastic extension of bureaucratic control which is now the dominant theme of British economy." Measures, it adds, have been taken which are contrary to historical liberal trading principles, and to the vital framework in which world recovery should be promoted. Many of the steps taken had intensified, rather than ameliorated British economic difficulties.

Eyes on the North

SCOTLAND, whose persistent complaint in the past has been that too little of the kingdom's post-war industrial development was being allocated to the North, is beginning to see the balance weighted in its favour. The transfer of a relatively larger proportion of new industrial and scientific enterprise to the north of the border has been encouraged by a great number of factors in addition to the Government policy manifested by the decision which has allocated to East Kilbride, near Glasgow, the large headquarters of several branches of scientific research. Likely to prove as important as any was the recent announcement that 75 per cent of industrial estate building (with which chemical industry is fairly closely associated) is to go ahead, regardless of the restriction of capital investment which has halted so many other projects. A reversal of the oft-lamented "drift to the South" is logical enough, certainly from a strategic point of view, and more immediately because some of the vast schemes to provide relatively abundant hydro-electric power are taking tangible shape. The impetus provided by ample supplies of power not subject to "load shedding" might in the long run bring about a substantial redistribution of some chemical industries and even more metallurgical undertakings. Of the increasingly widespread interest in Scotland as the home of new factories our news columns have provided abundant evidence. No one, however, appears yet to have paid very serious attention to the factor still liable to apply a brake to future developments—Scotland's very restricted industrial labour force, the shortage of which has greatly hampered the growth of the potentially vital shale oil industry.

Competition for Workers

THE possibility that the shale mining industry may be deprived of more of its labour was advanced as one of the

Boys Hostels' Jubilee

21 Years' Service to Youth

NEXT month the Boys Hostels' Association will celebrate its 21st anniversary at John Benn House, the well-known residential club in Stepney, where many hundreds of homeless boys have spent their formative years from 14 to 18. King George's House, a second club which H.M. the King opened in Stockwell in 1937, was too badly bombed for further occupation, but a licence has just been secured to commence repairs to what is probably the finest building of its kind in the country.

As a mark of their confidence in the association, the Carnegie Trustees have just notified its president, Lord Leverhulme, that they will cancel their mortgage on John Benn House; and a further compliment has been paid by the Lord Mayor of London, who has generously offered the Mansion House for the 21st anniversary dinner, at which he will preside on May 6.

Healing the Casualties

Although the plight of homeless boys is somewhat easier than in 1927, when many in East London were still sleeping under railway arches, 40 per cent of the present boys are orphans, 37 per cent come from broken homes, while others have faced personal tragedies which are nearly always healed by loving care and guidance in the right surroundings.

Speakers at the 21st anniversary dinner will include Lord Elton, the Headmaster of Shrewsbury (Mr. Wolfenden) and Sir Ernest Benn, who was largely responsible for founding the association as a memorial to his father, the late Sir John Benn.

Linseed Oil Substitutes

Raw Material Difficulties

ADDRESSING the 26th annual general meeting of Michael Nairn and Greenwich, Ltd., at Kirkcaldy, this week, Sir Michael Nairn, Bt., chairman, said that the supply position of the linoleum industry's most vital raw material, linseed oil, had somewhat improved.

Whereas a year ago, he said, the Government allocation was on the basis of approximately 10,000 tons per year, it had now been increased to 18,000 tons. This amount was still only half the pre-war annual usage, however, and fell a long way short of the estimate of 44,000 tons which the industry could profitably use in 1948.

No Promises

"The industry continues to press strongly for a much larger share of the oil supplies," continued Sir Michael, "but so far we have been unable to obtain any assurance from the Government that the position will improve or even that the present inadequate supplies will be maintained."

With regard to research, the company had been persevering in the search for a linseed oil substitute, a field in which it had achieved some success. Many of these alternatives were also in short supply and none of them could be regarded as a complete substitute for linseed oil. The company had also been handicapped further by the fact that alternative materials had to be of a nature suitable for processing in the existing plant, as it was impossible today to obtain delivery of new machinery unless it were agreed to wait an unreasonable period.

NOTES AND COMMENTS (*Cont. from page* 127)

reasons in support of the recent claim by the Shale Miners' and Oil Workers' Union for payment of a ten per cent increase in all basic wage rates and some other rises by Scottish Oils, Ltd. The situation there incidentally brings into prominence the struggle between undermanned industries and its unavoidable result. The oil company has shown that from 1920 to 1942 wages of shale miners were on the whole better than those of coal miners. Now the recent increase given to daily wage earners working above and below ground in the coal mines has given the advantage to the colliery workers—which the shale miners seem determined to share. The situation there is familiar enough, the competitive bidding for improved wages or conditions, and with regard to the latter the chemical and metal industries are liable to be handicapped by their old reputation as "dirty" trades. So long as the existing disequilibrium of labour force and labour needs continues Scotland's very limited industrial popoulation is likely to discourage any large-scale removal of chemical industry to the North.

CHEMICAL PRODUCTS OF COAL CARBONISATION

The conclusion—Part IV—of Dr. John R. Campbell's paper, "Chemical Products of Coal Carbonisation" will appear in next week's issue, No. 1490, *of* THE CHEMICAL AGE.

CHEMICAL PRODUCTION & EXPORTS

Manchester Committee's Advice to the Government

TO meet export needs, the Government will require carefully to balance the reduced capital equipment programme in order to ensure that the chemical industry is not deprived of essential plant required for export production.

The foregoing is one of the considered conclusions in the report of the Chemical and Allied Trades Section of the Manchester Chamber of Commerce (chairman: Mr. Forrest-Hewit), which provides a well-balanced review of the principal factors affecting the industry in 1947.

Similarly, this report points out, the recent Control of Engagements Order will have to be administered with care, for although the present labour force is generally reckoned to be adequate, replacements must be made available for filling the vacancies caused by the normal wastage which occurs in all manufacturing industries.

Of the effects of the fuel crisis in the spring upon production of chemicals, which was at a satisfactory high level when the year began the report records: Production fell to approximately 50 per cent of the level achieved in November, 1946. Recovery from this paralysing blow has been extremely difficult, as a vicious circle of shortages in the auxiliary industries supplying items such as containers, packages, etc., has delayed the resumption of full output. In June, it had only increased to 80 per cent of the November 1946 level, and it is only as the year closes that the industry can once more be said to be approaching peak activity.

Export Target

In September, Sir Stafford Cripps, then President of the Board of Trade, spoke to industrialists about measures that must be taken in the national interest to combat the desperate economic crisis which had overtaken the country.

The position of the chemical industry is, however, a special one, and after the matter had been taken up with Mr. Harold Wilson, the situation was clarified. It has now been explained that it is the first duty of the industry to supply the needs of other industries with export targets, and the essential needs of vital home industries, such as fertilisers for agricultural purposes and pharmaceuticals for the public health services. Only after these requirements have been met is production to be diverted to export channels.

Nevertheless, the industry has achieved a high export performance, having sent abroad £56,120,000 of chemicals of all groups in the first ten months of the year, compared with £55,000,000 in the same period in 1946, and £18,560,000 in 1938. For the purpose of comparing results achieved with the target set, the Board of Trade has taken the fourth quarter of 1946, when exports totalled £17.53 millions, as the index figure of 100. An index of 117 represents the comparative export target for mid-1948. The actual export performance of the industry in the third quarter of 1947 represented an index figure of 95—a praiseworthy achievement when it is remembered that this period includes the holiday season.

Chemical Transport Regulations

Reviewing the effects of nationalisation and other influences on chemical transport affairs, the committee records its satisfaction with the exemption of C licensed vehicles from the rigid restrictions originally recommended and notes that the special position of the chemical industry has also been recognised and the large container-vehicles which are frequently used for carrying chemical liquids in bulk, are exempt from the necessity of obtaining a permit for travelling long distances. In connection with the transportation of dangerous substances, the Explosives Department of the Home Office, after consultation with the industry, is to promulgate regulations which will be effective early next year.

German Chemicals

It is now understood that the level of output which will be permitted in practically all branches of the German chemical industry will be similar to that achieved in 1936. It has been said that it will now be the aim of the Allied Control to stimulate the maximum currency return from Germany's export programme in order to speed her recovery. In this her former chemical industry is expected to play a big part.

It would appear therefore that the German chemicals industry will gradually be developed and resume its pre-war activities in the export markets. This is an essential for the re-establishment of German industry.

The Chamber, in April last, drew up a resolution stressing the need for balancing industrial development in ex-enemy countries, and at the annual meeting of the Association of British Chambers of Commerce, to which it was submitted it was agreed that it be forwarded to the Government Departments concerned.

Textile Resins Development

Agreement with Ciba, Ltd.

AERO Research, Ltd., and British Industrial Plastics, Ltd., announce an agreement between Ciba, Ltd., Basle, and themselves whereby the full development can be secured in the textile industry of the field of melamine resins, according to Henkel's British Patent No. 455,008 and Ciba, Ltd., British Patents including Nos. 468,677, 486,519 and 486,577.

Licences have now been obtained for the manufacture and supply of the necessary materials, and their use for textile applications under the Ciba British Patents, including Nos. 466,015, 477,841 and 482,345 has now been agreed. Consequent upon these arrangements, Aero Research, Ltd., and British Industrial Plastics, Ltd., are now in a position to offer these materials through their agents to the trade.

Extended Research Facilities

An era of greatly intensified coal production is envisaged at the Point of Air undersea colliery, Flintshire, encouraged by the discovery, confirmed by the National Coal Board, of a new eight-ft. seam of first-class coal, which is held to have "limitless possibilities." Borings on the Flintshire bank of the Dee estuary confirmed the presence of the seam at a depth of about 3000 feet. A new shaft, and possibly a new colliery, designed to utilise the most modern methods of mechanised coal-getting will be established on the site.

The full extent of the new coal measures has not yet been determined, but it is confidently expected that this seam alone will exceed the return from the last big discovery in South Wales, when new measures estimated at 10 million tons were located. The sinking of the shaft will be undertaken as soon as existing work permits.

More Coal from N. Wales

The Air Ministry has advised the A.S.P. Chemical Co., Ltd., Gerrards Cross, Bucks, that it is evacuating Bulstrode Park and handing over the property to the company to enable it to extend its research work. Bulstrode was taken over by the Air Ministry some time prior to the war, and was utilised throughout the war as an R.A.F. staff college. The mansion and grounds will now be converted into a research station on tropical agricultural and biological research, particularly for research on sisal waste and the waste from other tropical plants. A special section of the mansion will be devoted to research on ion-exchange and trade effluents generally.

Monsanto's Programme

Expansion in U.S.A. Envisaged

IN an interview with THE CHEMICAL AGE New York correspondent, Mr. Wm. M. Rand, president of Monsanto Chemical Co., stated that his company anticipating a sustained consumer demand, planned to continue its expansion programme, rather than wait for a reduction in present-day high building costs. The 1948 sales picture was generally encouraging despite the fact that there might be a falling off in requirements by such industries as pulp, paper, rubber, fertilisers and textiles. Any such decline would be offset by a continuing demand for drugs and soap, and heavier consumption by the automobile, steel, petroleum and building industries.

Export Market Obscure

The export market for 1948 was still obscure, Mr. Rand said. Diminished or exhausted dollar reserves abroad would cause a sharp decline in chemical shipments compared with 1947 unless the Marshall Plan, or some other economic relief measure, provided the distressed countries with purchasing power. Although the foregoing factors will exert considerable influence on Monsanto's annual sales, this year's income should exceed that of last year. Monsanto's Organic Division, for example, expected to achieve a better turnover, partly by development of new products.

Extensive development work was being carried on in such fields as chemotherapeutics in plastics and coatings, and in the full range of insecticides, fungicides and herbicides. These, and many of the company's other products, were in constant demand.

More Raw Materials

Raw materials, many of which were scarce during 1947, should be available in greater quantity this year, especially from July-December. It was still difficult to get definite assurance from many suppliers as to when deliveries could be made however, and construction delays during 1947 prevented them from starting operation and from meeting demands. One of Monsanto's activities, that of furnishing the design and catalyst for sulphuric acid plants, had a very full programme for 1948. In fact, it exceeded that of any of the peak war years.

The tank car shortage, which was still acute, and was expected to continue into 1948, will have an important bearing on the level of production.

As regards prices, increases in the chemical industry have not been drastic, with the possible exception of products derived from vegetable sources.

Restrictive Practices

Minister Forecasts Government Action

MR Herbert Morrison, Lord President of the Council, is reported by *The Financial Times* as having said at a Labour Party meeting at Letchworth last week, that he agreed there was a problem arising from the old practice of private enterprise refusing to make known certain inventions so as not to upset prices.

"I am pretty confident," he declared, "that before this present Government has finished its labours we shall have important legislation dealing with that general subject."

More for Research

Reviewing Government participation and future policy in the development of scientific research for industry, Mr. Morrison expressed his agreement that the industry could not give the country what it wanted in increasing abundance at decreasing costs unless science became "more of a partner and less of a Cinderella."

"In future," he said, "we must get used to setting aside for science bigger resources and more manpower, as our Government is already doing, if we are to get maximum results."

There has been an increase in the number and the effectiveness of research associations in industry, but there was room for more. He was well aware that no direct benefits to industry could immediately result from the fundamental research now in progress, and in the meantime, he said they would rely chiefly on two main types of scientific contribution. First, the more effective use of the really vast amount of scientific knowledge which already exists but has not yet been fully applied in British industry, and second, by the harnessing of the new and vital sciences to help managements and workers in their daily problems.

Growing Recognition

Mr. Morrison described as a healthy sign the fact that in several industries, particularly cotton, iron and steel, workers were becoming increasingly conscious of the manner in which science aided their skill. He was glad to notice the interest taken by trade union leaders in the work undertaken by the research associations of their own industries.

He affirmed that the Government's encouragement to scientific and industrial research would continue.

B.I.F. Plans.—Dunlop are showing in all three sections of this year's British Industries Fair (May 3-14). General Rubber Goods Division and Dunlop Special Products will stage displays at Castle Bromwich.

Six-Months' Tin Supplies

Smaller Quantities for Distribution

ALLOCATIONS of tin metal for the first half of 1948 will fall short of those granted for the previous six months. This is due to wartime stock accumulations found in the Far East having now been distributed. A statement to this effect was given by the Ministry of Supply when it announced the Combined Tin Committee's interim allocations, totalling 17,703 long tons, last week.

The amounts allocated, says the statement, represent more than half of the total allocation that each country can expect for the first six months of this year.

Interim allocations (in long tons) are as follows:—

Canada, 1090; Chile, 32; Czechoslovakia, 336; Denmark, 160; Finland, 60; France, 2720; Germany (U.S.-U.K. zone), 324; Germany (French zone), 120; Hong Kong, 100; India, 1400; New Zealand, 146; Palestine, 55; Poland, 520; Switzerland, 200; Turkey, 140; United States, 10,200, and others, 100.

MALAYAN TIN PRICES

FOLLOWING a meeting in London last week between representatives of the Ministry of Supply, the Colonial Office and the Malayan Chamber of Mines, the following joint statement has been issued:

"The Departments concerned and the Chamber much regret that, owing to a series of misunderstandings, inaccurate accounts have received currency of the circumstances in which the price of Straits tin was recently raised from £423 to £500 per ton, and in which this decision was communicated to the Governor of the Malayan Union. At a meeting which was held on December 11, the Chamber, after considerable discussion, was informed that H.M. Government was not in a position to offer a price of more than £500 and the Chamber replied that it was not in a position to accept this price. The attitude of the Chamber was duly reported to the Governor of the Malayan Union by the Secretary of State for the Colonies. His Majesty's Government considered that no useful purpose would be served by further delaying the increase in the price and the new price accordingly became effective on December 19."

The whole question of tin prices, including the protection of the premium on Straits tin, was discussed and will form the subject of a further meeting.

Parcels for Palestine. — The G.P.O. announces that insured letters, parcels and boxes may not be sent to Palestine until further notice.

A New Approach to Nitrate Hazards

French Contributor's Unorthodox Theory*

by HENRI SPINDLER, Chemical Engineer

THERE has been no lack of attempts at explanation of disasters associated with ammonium nitrate. In this respect, it is only necessary to read the articles which appeared in the scientific reviews after the explosion at Oppau in 1921. It is impossible to find in them anything but hypotheses. In 1947, Professor Laffitte[1] arrived at the conclusion that it would be necessary to engage in new research work in order to find out under what conditions ammonium nitrate, which is the basic cause of all the explosions, should be handled.

Generally Stable

In fact, ammonium nitrate, which is one of the most important products of the heavy chemical industry, has been studied in all its bearings. It has been shown that it is generally impossible to provoke the detonation of ordinary commercial grades. The frequent use of dynamite cartridges to dislocate mountains of agglomerated salt is an indication of the stability which can generally be assumed.

Ammonium nitrate (NH_4NO_3) melts at about 170°C. A little beyond its melting point, that is to say, from 200 to 260°C., the salt decomposes without any destructive effect, while giving off a vapour of steam and nitrous oxide (protoxide of nitrogen). At a higher temperature, the reaction becomes complicated and, when red-hot, the total decomposition into steam, nitrogen and free oxygen occurs. This is not exceptionally rapid.

It is admitted, on the other hand, that it is possible to detonate ammonium nitrate by priming it with an explosive such as fulminate of mercury, and even in that case the proportion of fulminate would have to be relatively high. It has been noted also that the explosive properties of ammonium nitrate are strongly influenced by the presence of foreign substances, even in small quantities.

This is, more or less, all the classic knowledge we have. No precise data on the formation of a chemical system, on the chain of reactions which might develop within a mass of ammonium nitrate have been given. Orthodox chemistry seems to have been completely unable to find the real origin of the catastrophes which have occurred with relative frequency in the ammonium nitrate industry.

Research work of a completely different nature which I have been carrying on for many years, to clear up the chemical mechanism of chlorophyllian assimilation, has led to what I believe to be unknown chemical phenomena, of which I gave a first description in part 28 of the *Bulletin du Laboratoire Maritime*, of Dinard (December, 1946): "The phenomena of transmutation in the living world: The origin of iodine in seaweed: Chlorophyllian assimilation."

This contribution endeavoured to show that the living world was liable to undergo transmutations by means which have nothing in common with the technique of nuclear physics. In living protoplasm, for example, matter exists in a state of indifference, which cannot be related to atomic nuclei, etc. The fact that these phenomena are of a nature to conflict very directly with present scientific outlook does not change in any way the reality of their existence, which can be proved by multiple experiments.

I was able to reproduce *in vitro* in the laboratory, reactions of essential transmitations, which are accomplished in the vegetable world on a very large scale and which are linked with the intermediary formation of fulminic acid and hydrocyanic acid and their derivatives. I was led in this way, a few years ago, to study the reactions which took place when making ammonium nitrate react with formic aldehyde, even in very small quantities.

Theory

It is known that formol is an intermediary product of the oxidation of nearly all the organic bodies. A sufficiently complete list of these properties has been made by Fosse.[2] It may be assumed that, at a given moment, ammonium nitrate comes into contact with some organic substance, wrapping paper, for instance. Aided by a slight increase of temperature, a series of reactions can be produced, which are worthy of examination.

Here is a very simple examination: A quantity of ammonium nitrate is dissolved in a solution of commercial formol in an open balloon glass with a wide neck. This is heated without precautions up to 120°C. After it begins to steam the heating is continued gradually; at 170°C. the substance takes on a reddish-brown colour. It is possible sometimes to elevate the temperature to nearly 200°C. A mild explosion then takes place; the glass is not burst, all the gases coming from the deflagration escaping by the neck of the balloon. An

* The publication of this article was sought by the Marquise de Fleury, in whose view the theory it presents is deserving of consideration.

explosion, on the contrary, occurs if the departure of the water is effected at a lower temperature under reduced pressure in a partial vacuum; the substance then becomes a ruby red colour.

I was led to try this experiment for the following reasons: It is admitted that the formation of protoxide of nitrogen N_2O by heating of nitrate is preceded by a transposition of ammonium nitrate NH_4NO_3 in a molecule of nitrous acid NO—OH and a molecule of hydroxylamin NH_2—OH (even when cold a violent disengagement of protoxide of nitrogen N_2O is obtained by making a reaction of nitrate of sodium and sulphate of hydroxylamine in solution).

I have sought to verify this hypothesis by heating ammonium nitrate in a solution of formol in water. I thought that this intermediary isomerisation would reveal itself by the appearance of the characteristic colorations of the methylnitrosolic acid HO—N $=\frac{NO}{H}$ which reaction I had previously obtained by passing nitrous anhydride N_2O_3 in a solution of formaldoxime $CH_2=N—OH$ in sulphuric ether.

The experiment showed that in these conditions the methylnitrosolic acid was not able to exist owing to the strongly oxidising character of the ammonium nitrate. On the contrary, there was a formation of methylnitrolic acid HO—N=C $\frac{NO_2}{H}$ and of other compounds like methylazaurolic acid $C_2H_4O_2N_4$.

Detonating Agents

It is known that methylnitrolic acid can be considered as a derivative of fulminic acid. It has been shown in this way that the action of formol on ammonium nitrate gives rise to a chemical system containing fulminic acid or its derivatives, creating in this way the possibility of a complete detonation.

This may be presented as a primary cause of the accidents, which may satisfy classic science. But on examining the question quantitatively it would seem that the quantities of fulminate furnished by this process just described are insufficient to cause the complete explosion of nitrate.

It should be noted that this is only the first phase of the phenomenon which is really very much more complicated and which itself causes new reactions. This is apparent in the chemistry of plants. It is not possible in the scope of this article to give in detail the whole of the reactions which may be produced. These phenomena may, however, be studied in the processes of a reaction which in itself presents no danger. It was sufficient to pass the nitrous anhydride N_2O_3 in a solution of cyanide of potassium in water or in methylic alcohol. The colorations and products obtained will provide confirmation.

The reaction of formol with ammonium nitrate will give rise effectively to the formation of numerous compounds; formiate of methyl, amines, amides, urea, derivatives of hydrocyanic acid and fulminic acid, organic compounds in C_2 and in C_3. I indicated in the *Bulletin du Laboratoire Maritime* some reactions of transmutations which gravitate around these compounds and which can be obtained *in vitro* and analysed quantitatively. I drew attention specially to the explosion of hydrocyanic acid as an illustration of these phenomena of transmutation.

Complex Reactions

The handling, the transportation and the stocking of hydrocyanic acid have already brought about numerous accidents, the cause of which is unknown. During the explosion, in a medium containing no trace of oxygen, there were formed very important quantities of oxide of carbon, obtained by the intra-atomic transposition of a molecule of nitrogen N_2 in a molecule of oxide of carbon, which it was not possible to reproduce with certain other compounds. The organic substances which are thus formed after the nitrogen, react once more on the ammonium nitrate initiating the chain of reactions—which end in the devastations of which we have periodical examples.

To sum up, it is therefore possible to affirm that the great catastrophes caused by ammonium nitrate start with the contact of an often infinitesimal quantity of some organic substance which in the presence of an oxidiser such as ammonium nitrate, causes the formation of formic aldehyde. A series of reactions can also be produced which end up notably by the formation of fulminic acid and hydrocyanic acid (C = N.OH), which can transmute their nitrogen into oxide of carbon with formation of new organic substances which react again with the nitrate to bring about violent oxidation.

All the requisite conditions were present at the moment of the explosion of the *Grandcamp* at Texas City; nitrate wrapped in paper and a fire which broke out on board. We may ask ourselves also if the pollution by organic matters did not already exist at the moment the product was shipped, at which time, according to the report of the National Board of Fire Underwriters, it was of a brown colour.

It is not possible to study, in the scope of this article the very interesting reactions which can take place when ammonium nitrate is associated with ammonium sulphate, as it was at Oppau.

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[2] R. Fosse L'Uree (*Presses Universitaires de France*), 176.

The Case for Continuous Processes

Widening Applications Surveyed

THE modern trend in chemical industry is to make processes continuous. The advantages which follow application of the principle vary with the individual industry. There are many industries in which both batch and continuous processes are successfully employed, and it by no means follows that all batch processes will be abandoned in favour of continuous operation. The problem is best considered in relation to the physical state of the reactants.

Reaction between Gases

Gaseous reactions may be divided into two types, first, those in which reaction is homogeneous in the gas phase, and second, those in which catalysts, solid or liquid, are the seat of reaction.

There are numerous examples of both in industry. The manufacture of sulphuric acid supplies an example in both classes; the lead chamber and contact processes respectively. The manufacture of synthetic ammonia from nitrogen and hydrogen is an example of a reaction between gases on the surface of a catalyst.

In all these gaseous reactions a continuous process is naturally employed. There is, however, a well-known example of a purely gaseous reaction being carried out in batches. The petrol engine employs a gaseous mixture of petrol vapour and air in successive batches. The use of multiple cylinder engines is one way in which the disadvantages of a batch process have been countered. The jet engine may be considered as a machine designed to convert a batch to a continuous process.

Gases and Liquids

On the subject of reactions between gases and liquids, industry to-day is probably equally divided between batch and continuous operation; the advantages of a continuous process are not so self-evident. There are two main types of reaction in this class; those which do, and those which do not, employ a solid catalyst.

In a reaction which has to be carried out on a very large scale the advantage in most cases lies with the continuous process. The chlorination of drinking water is a problem of accurate dosage and is carried out continuously.

The oxidation of acetaldehyde to acetic acid by air is carried out by both processes, although the tendency is to use the continuous method. The reasons for this change are pertinent to the present comparison and may be summarised as follows:—

(a) A greater degree of control making for greater safety in operation.

(b) Less plant leading to less cost and labour.

In the hydrogenation of oils in which gaseous hydrogen reacts with liquid oil in the presence of a solid nickel catalyst, both batch and continuous processes are used.

In the batch process the solid catalyst is used as a suspension in the oil and is therefore easily added to and taken from the reaction vessel. The necessity of filtering out the solid and returning it to the reaction vessel, however, is a disadvantage avoided by the continuous process in which a rigid nickel catalyst is used.

In this example the determining factor in the choice of process is chemical rather than mechanical. Considerations of selective hydrogenation both in the fatty acid and the triglyceride play their parts; it is the chemist rather than the engineer who decides between the continuous and batch process.

Reactions between Liquids

Probably a greater volume of material in this class is treated batchwise than continuously. The petroleum industry, however, has developed continuous processes on such a scale that the balance of material treated continuously may be greater if this industry be included.

Two types of reaction need separate consideration. In reactions between liquids requiring high pressures resulting from the necessity of using high temperatures there is a considerable advantage in operating continuously. The reaction vessel may be tubular and its length calculated to give the necessary time of reaction. This simple construction is less costly and safer to operate and requires less labour, particularly skilled labour. The tubular plant has, on the other hand, the disadvantage of being difficult to clean, particularly when solid deposits are liable to accumulate unless modifications, usually involving numerous joints, are employed, which would rob the plant of some of its simplicity.

Where pressure is not used or developed, the advantages of continuous operation are countered by the employment of ever larger and larger reaction vessels. Examples which may be quoted are found in the refining of petroleum by acids and alkalis, the refining of vegetable oils by caustic soda and the saponification of vegetable oils and fats by caustic soda as in soap manufacture.

When, for example, 100 tons of vegetable

oil can be refined in a single vessel and one man can attend to a battery of such vessels, the necessity for a continuous process is less obvious.

Nevertheless, continuous processes have been invented for these large-scale operations and are being more generally adopted. The continuous refining of vegetable oils by caustic soda probably leads to a greater degree of separation of oil and soap, so that greater purity of product must be added to the list of advantages which may be gained in particular cases. The continuous production of soap is a modern development and the older generation of soap makers may view with regret the changing of an art into a science.

Saponific Action

In soap making a succession of operations is involved :—

(a) Saponifying 90-95 per cent of the oil.

(b) Opening the texture of the soap by salt to drop out the glycerine lye.

(c) Completing the saponification and settling out the lye.

(d) Fitting the pan or closing the texture of the soap by the addition of water.

These are processes which can be and are carried out in a battery of large pans, operated by a single skilled man who keeps his pans in different stages and takes a week to complete the cycle of operations from oil to finished soap.

This procedure requires a large quantity of material in process, and since the soap has to be kept hot for a week, considerable consumption of steam. A ton of soap may require two tons of steam before it leaves the pan. Quicker turnover and saving in steam have been the main incentives to engineers to invent a continuous process in an industry which would at first sight not seem to need it.

Whatever industry decides, it might be predicted, that if the continuous manufacture of soap is generally adopted, no other process is safe from the engineer's ingenuity.

Gas-Solid Reactions

This type of rection has been partly considered under the title of reaction between gases requiring solid catalysts, such the manufacture of synthetic ammonia Typical gas-solid reactions in industry are the purification of coal gas by bog iron ore; the removal of benzene from coal gas by active carbon; the removal of acetone from air by active carbon in cellulose acetate silk works.

In these processes the gas or air is purified continuously by duplicating the purifiers, though the solid is treated batchwise, being regenerated *in situ*. A modern invention, so far confined in its application to the petroleum industry, makes the reaction continuous between gas and solid both for the petrol vapour and the solid catalyst.

In the Hondry process for cracking petroleum the solid catalyst in small pellets is floated, by pressure of the vapour due to its velocity, from the reactor to the purifier. In the reactor the catalyst slowly becomes carbonised and so is blown continuously to a purifier in which an air stream burns off the carbon and floats the solid back to the reactor. This development is evidence of the advantage of a completely continuous process.

Liquids and Solids

There are numerous examples in industry of both batch and continuous processes in liquid-solid reactions. The bleaching of vegetable oils by active carbon or fuller's earth or both is usually carried out in batches. The subsequent separation of oil and spent carbon or earth, however, may be carried out in batches, in respect of the solid, in a plate-type filter press or continuously as in the Oliver type filter press. In the solvent extraction of oils from vegetable seeds both processes are used. The batch process is probably in more general use to-day but less likely to be so in the future.

Chemically two solids do not react as such but mechanically the problem of mixing them is dealt with by both processes.

The manufacture of cement is carried out continuously by mixing and heating together to sintering point lime and alumina. A solid fuel powdered coal is used continuously to fire the rotary furnace. Many packing and tabletting machines handle solids continuously.

In the plastics industry solid pellets are fed into a machine continuously and emerge at the other end moulded to the finished article in infinite variety.

Conclusions

From these considerations it is apparent that progress in industry has often been the conversion of a batch to a continuous process. It will be appreciated that all possible advantages seldom apply to individual cases. In fact some advantages may be of sufficient importance to outweigh definite disadvantages in the continuous method, such as a greater degree of control. This may result in greater safety in explosive or poisonous reactions; or better yields in dealing with unstable products.

The production of a more uniform product is another common merit of continuous operation. The minute-to-minute condition of a batch process is never the same. In a continuous process the conditions tend to remain the same in the same part of the

(*Continued on page 141*)

PROGRESS IN DRUGS AND FINE CHEMICALS—III

Prospects of Development of Streptomycin

by G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

IT is well known that streptomycin treatment offers some hope of success in the attack on certain forms of tuberculosis. This problem is undergoing most careful examination, especially in America where the drug is considerably more plentiful than it is in Britain. By the very nature of the problem the determination of the full usefulness of the drug will be a prolonged business and estimates made to date of its effectiveness in the treatment of tuberculosis are to be accepted with caution and regarded as no more than tentative. There are no grounds nor moral justification for the over-optimistic note which has been struck on occasion during 1947 in the lay Press concerning the effectiveness of this drug in the treatment of tuberculosis.

Varying Response

Perhaps the most important summary of the advances and estimates which have been made during 1947 was that published in the *Journal of the American Medical Association* (November 8, 1947) by an American group studying streptomycin in tuberculosis treatment. Recommended doses of the drug are now 2.0 grams streptomycin daily administered in the form of four-hourly doses of 0.4 gram from 8 a.m. until midnight. Three hours after injection the average concentration of streptomycin in the serum is 10-20 micrograms/ml. In very acute infections an additional daily injection of 100 mgm. is given intrathecally.

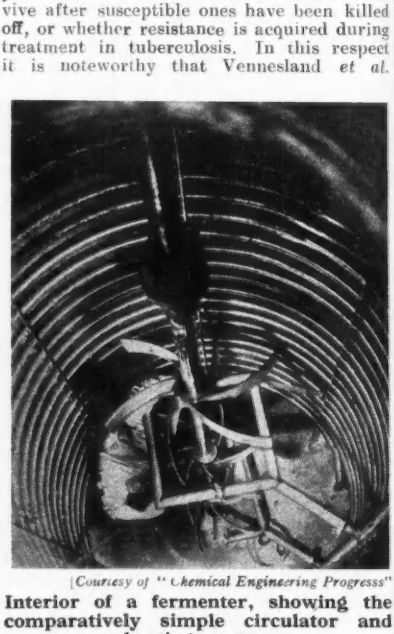
Reports by this group of workers on the result of the treatment are extremely cautious. Certain types of tuberculosis respond to the extent of clinical improvement. In other types the treatment is palliative. The results with other types are either *sub judice* or else the treatment appears to be of no benefit to the patient.

Cooper and Cohn (*Science*, 1947, *106*, 446) claim the existence of a remote sustained threshold therapeutic action of streptomycin in tuberculosis. Once the threshold has been initiated minimally the effect persists for some time; above the maximum threshold effect it is needless to continue forcing treatment since the benefit derived does not exceed that of the established maximum. This suggests that an economy can be achieved in the use of the drug in this disease without a loss of effectiveness. The authors consider the action of streptomycin in tuberculosis is complex and intimate and is not merely a retarding effect on the organism such as is found *in vitro*. The actual *in vivo* mechanism still remains to be disclosed satisfactorily.

Dobré and his co-workers (*Brit. Med. J.*, December 6, 1947, 897) cautiously report hopeful results from the treatment of tubercular meningitis in children at the Hôpital des Enfants Malades, Paris. It is in the field of tubercular meningitis and miliary tuberculosis that most hopeful results are to be obtained although long-term results are considered still to remain in doubt.

Limiting Factors

There are two disturbing features of streptomycin treatment; the first the toxic effect of the drug; the second the development of resistance. Some American workers consider the latter the more serious of the two in the treatment of tuberculosis. It is not yet known whether resistant strains survive after susceptible ones have been killed off, or whether resistance is acquired during treatment in tuberculosis. In this respect it is noteworthy that Vennesland *et al.*



[*Courtesy of "Chemical Engineering Progress"*

Interior of a fermenter, showing the comparatively simple circulator and heating system

(*Science*, 1947, *106*, 476) have actually isolated streptomycin resistant variants from stock laboratory cultures of the human strain of tubercle bacillus, H-37 RV; but the importance of these resistant strains *in vivo* during streptomycin treatment is not known.

The toxicity of streptomycin is in sharp contrast with the non-toxicity of penicillin in clinical dosages. At one time the toxicity of streptomycin was thought to be associated with the presence of impurities which, among other things, had a histamine-like action; but the toxicity is now generally believed to be an intrinsic characteristic of the pure drug.

The Council on Pharmacy and Chemistry of the American Medical Association has offered a brief statement on the status of streptomycin (*J. Amer. Med. Ass.*, 1947, *135*, 839), although they point out that it is difficult to "classify the nuances of experience with a drug of recent development." It is stated that streptomycin is considered to be effective in tularemia, plague, meningitis due to all gram-negative bacilli, urinary tract infections due to certain susceptible organisms, as well as other infections due to gram-negative bacteria.

Official Recognition

In Britain, the Ministry of Health (*Pharm. J.*, September 6, 1947, 160) has issued a statement indicating that, as a result of preliminary trials of the Medical Research Council, patients suffering from tubercular meningitis or miliary tuberculosis should be given the opportunity of receiving treatment with the drug as supplies permit. The drug continues to be very scarce here and we are largely dependent upon the U.S.A. for supplies. It is understood that a pilot plant will shortly come into operation at Speke.

America is, for the time being, the principal manufacturer. Her output has been reported in various quarters to have been (in grams): March, 1946, 26,332; December, 1946, 200,049 July, 1947, 1,000,753; August, 1947, 873,449; September, 1947, 1,041,000.

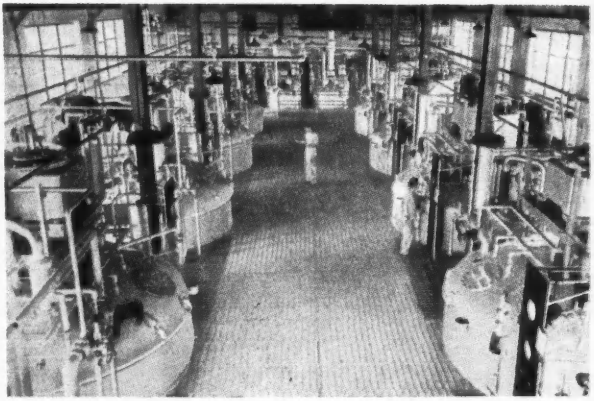
Since October, 1946, quantities of the antibiotic have been released by the American Government for export in order to meet urgent needs in other countries and this release has increased with increasing output thus (in grams): July 1947, 125,000; August, 300,000; September, 400,000; October, 600,000 (authorised).

Falling Prices

The price, £5 per gram in 1946, fell to about 30s. per gram in March, 1947, reflecting the effects of increased output. It has been estimated that the price would continue to fall and settle at about 7s. 6d. per gram in 1948 when, it is expected, demand from U.S.A. makers will reach a million grams a month.

The first at all extensive description of large-scale streptomycin production has been given in *The Merck Report*, (July, 1947, p. 4). Costing $3,500,000, the plant was producing streptomycin at the rate of 500,000 grams per month in July, 1947, and that does not represent its ultimate capacity.

The fermentation medium containing glucose, peptone, meat extract and common salt is prepared and stored at ten times required concentration. As required, the concentrate is let down in 15,000 U.S. galls, fermenters fitted with equipment similar to that already described in this review in connection with the Cutter Laboratories peni-



Probably the most highly developed fermentation system existing for the production of antibiotics is the plant shown here, operated by Merck & Co., Inc., at Elkton, Virginia. Each tank deals with 15,000 gallons

[*Courtesy of "The Merck Report"*

cillin plant (THE CHEMICAL AGE, January 10). The wort is sterilised at 120°C., cooled and innoculated aseptically with mycelium built up in a series of shaker flasks. Fermentation is conducted at 25-30°C., and since, like *penicillium notatum*, the organism, *streptomyces griseus*, is highly aerobic, large volumes of sterile air are blown into the fermenting medium.

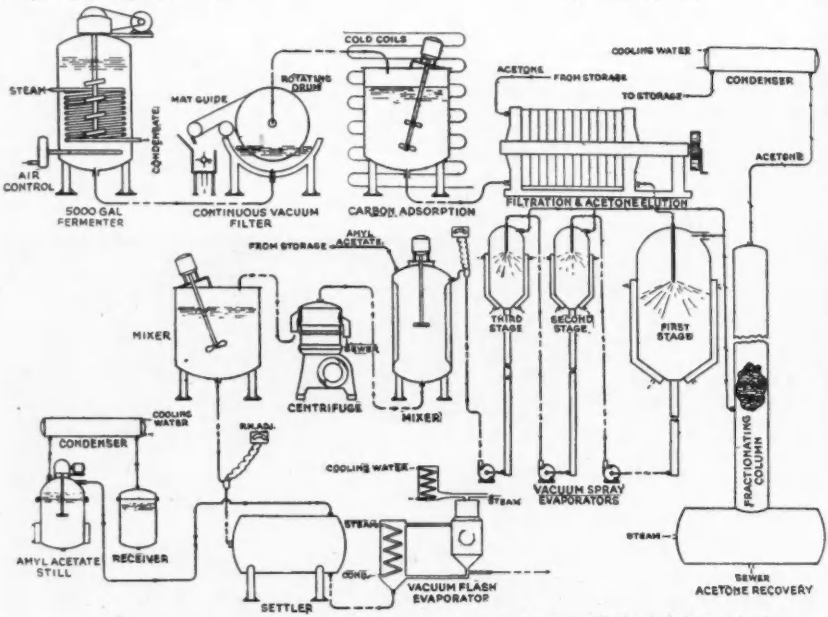
At the completion of fermentation the metabolite liquor is passed to a pre-coated continuous pressure filter, filter-aid being continuously proportioned with the broth by automatic means. A second "polishing" filter follows, with an automatic check on clarity of filtrate through a photo-electric cell.

Activated carbon is automatically and continuously proportioned with the filtered liquor and streptomycin is thus continuously absorbed as the liquor passes through a series of three agitated tanks. Streptomycin is removed from the carbon as its hydrochloride in a two-stage countercurrent elution operation using acidified alcohol. After neutralisation the eluate is concentrated *in vacuo* at 60°C. or less to 25 per cent solids, of which about one quarter is streptomycin hydrochloride.

The antibiotic is further purified by crystallisaton as the calcium chloride complex. This complex is adjusted for potency, bacterial-filtered, and freeze-dried by the usual high-vacuum sublimation process. Streptomycin calcium chloride complex—$C_{21}H_{39}O_{12}N_7$. 3 HCl. $\frac{1}{2}$ $CaCl_2$,—contains practically no impurities and, therefore, to this extent, it is of reduced toxicity.

The precise structure of streptomycin has not yet been fully established. It appears to be the *meso*—1 : 3-diguanidino-2 : 3 : 4 : 6 tetrahydroxycyclohexane glucoside of an unidentified disaccharide. One hexose component of the disaccharide is N-methyl-l(-)-glucosamine. Brink *et al.* (*J. Amer. Chem. Soc.*, 1946, *68*, 2557) reports that cleavage of streptomycin with methanolic hydrochloric acid yields streptidine and methyl streptobiosaminide dimethyl acetal hydrochloride, the latter being a derivative of a disaccharide-like molecule, streptobiosamine, $C_{13}H_{23}NO_9$. Later, Brink (*J. Amer. Chem. Soc.*, 1946, *68*, 2679) brought further evidence for the structure of streptomycin which he suggests is as follows: Where R represents the streptidine moiety and the rest of the molecule consists of N-methyl-l-glucosamine linked with streptose.

(*Continued on p. 140*)



[*Courtesy of "Chemical Engineering Progress"*

Flow diagram illustrating contemporary principles of penicillin production

OXYGEN DETERMINATION

New U.S. Method for Organic Compounds

THREE workers at the United States National Bureau of Standards, Messrs. W. W. Walton, F. W. McCulloch and W. H. Smith, have developed an improved technique for the direct determination of oxygen in high-molecular weight organic compounds by means of which small amounts of oxygen, such as occur in natural and synthetic rubbers, in plastics prepared from hydrocarbons and in mineral oils, can be measured with precision. This was announced last week by the Bureau.

Essential features of the procedure are thermal decomposition of the sample in an atmosphere of oxygen-free helium and conversion of the resulting oxygen compounds to carbon monoxide by passage of the products over carbon at 1120°C. The oxygen content of the material is then calculated from the percentage by volume of carbon monoxide in the collected gas as determined by the National Bureau of Standards carbon monoxide indicator.

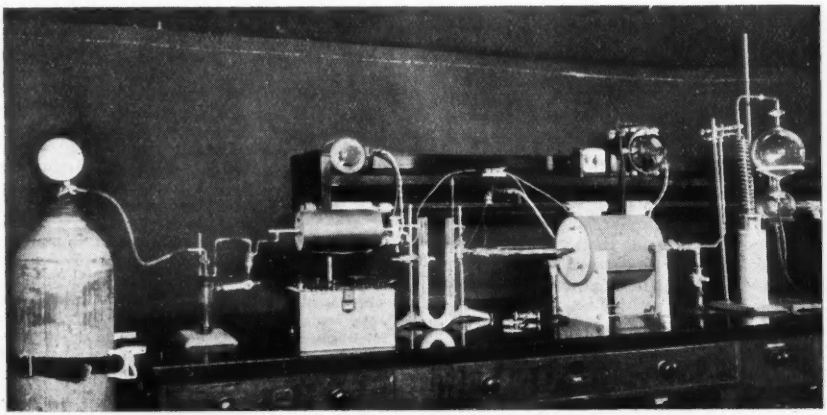
In the analysis of organic compounds, the amounts of elements other than oxygen have always been determined directly, while that of oxygen has been determined by difference. The value for oxygen determined in this manner, involving an accumulation of possible errors in the determinations of the other elements, has proved reasonably satisfactory in investigations of the structure of compounds of low molecular weight. For the analysis of compounds of high molecular weight or of substances containing very small amounts of oxygen, greater accuracy, however, is necessary.

In recent years, the need for a direct oxygen method has been especially pronounced in the fields of high-polymer plastics and synthetic rubber. Oxygen determination is important, for example, in studying the effects of various agents added to retard ageing of rubber and in ascertaining the influence of small amounts of oxygen on the physical properties of this substance relative to processing and vulcanisation, as well as in the basic study of the composition of the polymer.

Likewise, in the analysis of synthetic rubber there is need for extremely close agreement among values obtained by various laboratories in order that rubber produced by different plants may be interchangeable. The procedure just announced and developed at the Bureau is a modification of the micro method developed by J. Unterzaucher. It is expected to aid materially in this work, and the bureau believes that the method may be readily adapted to analysis of compounds containing large amounts of oxygen.

The apparatus consists primarily of a helium tank with pressure regulator, a furnace at 400°C. packed with copper

(*Continued overleaf*)



The sample in the horizontal quartz tube is ignited in the presence of purified helium by a Bunsen burner and gauze mantle. The decomposition products and helium pass over hot carbon in the tubular furnace and through a liquid air trap to the collection flask (right)

spirals through which the helium is passed to remove oxygen, a U-tube filled with ascarite and a drying agent to absorb carbon dioxide and moisture from the helium, a quartz tube having a section packed with carbon pellets, a tubular furnace enclosing that section of the quartz tube and heated to 1120° C., and a flask of accurately measured volume in which the carbon monoxide is collected.

The apparatus is arranged so that a continuous stream of helium is passed over the heated copper and through the drying agents into the quartz tube. After the weighed sample has been placed in the entrance end of the tube on a platinum boat, air is swept out of the system by means of a reverse stream of heated helium for two hours. The flow of helium is then directed forward through the high-temperature furnace toward the collecting flask.

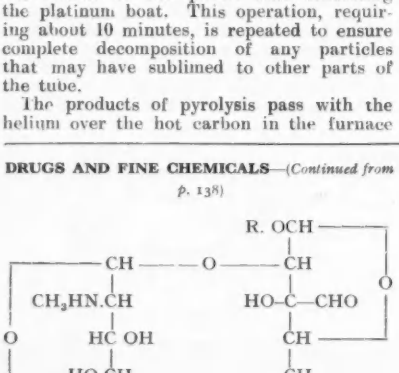
The sample is burned by slowly advancing a Bunsen burner and a gauze mantle along the section of the quartz tube containing the platinum boat. This operation, requiring about 10 minutes, is repeated to ensure complete decomposition of any particles that may have sublimed to other parts of the tube.

The products of pyrolysis pass with the helium over the hot carbon in the furnace and through a liquid air trap to the collection flask, where water is gradually displaced by the mixture of gases. After a given volume of gas has been collected, as measured by the water level in a capillary, the collecting flask is disconnected and a stopcock opened momentarily, allowing a small amount of air to flow into the flask to restore atmospheric pressure.

To determine the percentage by volume of carbon monoxide in the collected gas, the flask is connected through a flow meter to a carbon monoxide indicating tube, which contains a colorimetric indicating gel capable of detecting and estimating less than 1 part of carbon monoxide in 500 million parts of air.

After the gas has passed through the tube at the rate of 70 ml. per minute for a definite period, the colour shown by the indicating tube is compared visually with standard tubes prepared at the same time by passing known amounts of carbon monoxide through them. From the value obtained for the volume concentration of carbon monoxide in the collected gas, the volume of the gas (which is known by previous calibration of the flask), and density of carbon monoxide, and the weight of the sample, it is possible to calculate the percentage of oxygen in the material.

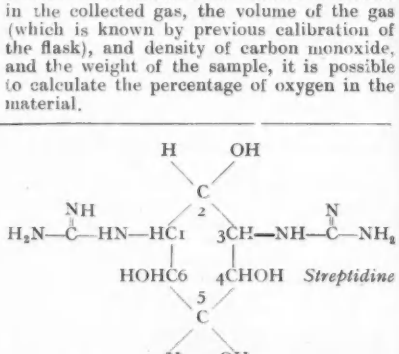
DRUGS AND FINE CHEMICALS—(*Continued from p. 138*)



Streptomycin

Carter (*J. Biol. Chem.*, 1947, *168*, 401) points out that streptidine is one of the eight *meso* forms of 1 : 3-diguanido-2 : 4 : 5 : 6-tetrahydroxicyclohexane and that, in streptomycin, the streptidine moiety is linked with the first carbon atom of streptose; but the point of attachment of streptose to streptidine is not known.

While no final conclusions can yet be drawn, Carter is of the opinion that the weight of evidence is in favour of attachment through linkage at position 5 in the streptidine molecule:



Streptidine

It now seems probable that commercial streptomycin is not a single entity since Titus & Fried (J. Biol. Chem., 1947, *168*, 393), using Craig's countercurrent distribution principle, have found evidence of another active structurally related substance. The second active fraction, designated streptomycin-B, has about one-quarter the activity of streptomycin against *K. pneumoniae* and 4-8 times the quantity is required to inhibit the growth of four other organisms as is required by streptomycin. The relationship between these two antibiotics is not yet clear; but each yields meltol on alkaline hydrolysis and it is probable that, in each case, maltol is derived from a streptose moiety. Streptidine (or an isomer) has been derived by cleavage of the dihydro derivative of streptomycin-B.

(*To be continued*)

Next Week's Events

MONDAY, JANUARY 26

Plastics Institute and Institution of the Rubber Industry (Manchester Section). Engineers' Club, Manchester, 6.45 p.m. N. J. L. Megson and G. J. Hammond: "Polymer Progress."

TUESDAY, JANUARY 27

Royal Institute of Chemistry (London and S.E. Counties Section). Technical Institute, Darnley Road, Gravesend. 7.30 p.m. C. W. Herd: "The Chemist in the Flour Mill."

Society of Instrument Technology. Royal Society of Tropical Medicine and Hygiene Lecture Theatre, Manson House, Portland Place, W.1, 6.30 p.m. G. E. Bennett, J. R. Richards and E. C. Voss: "Some Electronic Methods of Measurement in Engineering."

WEDNESDAY, JANUARY 28

Society of Chemical Industry (Liverpool Section). Chemistry Lecture Theatre, Liverpool University, 6.30 p.m. H. W. Cremer: "Water—A National Asset." (Jubilee Memorial Lecture). (Food Group). Rooms of The Chemical Society, Burlington House, Piccadilly, W.1, 6 p.m. W. Godden and E. T. Halman: "Farm Animals as Converters of Vegetable Food for Human Use."

Royal Institute of Chemistry (Cardiff and District and S.W.Sections). Mining and Technical Institute, Bridgend, 6.15 p.m. H. M. L. Irving: "Dithiyone and Trace-metal Analysis."

Royal Society of Arts. John Adam Street, Adelphi, W. C. 2, 2.30 p.m. A. J. Philpot: "Recent Progress in the making of Precision Instruments."

Institute of Welding. Institution of Civil Engineers, Gt. George Street, S.W.1, 6 p.m. J. Corston Mackain: "The Evolution of Welded Components in House Construction 2—Welded Bunkers in Power Houses."

Manchester Metallurgical Society. Engineers' Club, Manchester, 6.30 p.m. E. Davis: "Some Metallurgical Aspects of Jointing Non-ferrous Materials."

THURSDAY, JANUARY 29.

Royal Institute of Chemistry. Acton Technical College, High Street, W.3, 7.30 p.m. Film Display.

Chemical Society and University College of N. Wales Chemical Society. Dept. of Chemistry, University College of N. Wales, Bangor. 5.30 p.m. Professor D. H. Ney: "Reactions of the Ethylene Bond."

FRIDAY, JANUARY 30

Birmingham University Chemical Society, University, Edgbaston, Birmingham, 4.30 p.m. Dr. G. B. B. M. Sutherland: "Infra-red Spectroscopy."

Chelsea Polytechnic. Manresa Road, S.W.3, 7.30 p.m. L. Ivanovszky: "The Modern Chemistry and Technology of Waxes."

Manchester Statistical Society (Industrial Group). Textile Institute, St. Mary's Parsonage, 6.45 p.m. K. A. Brownlee: The Applications of Statistical Methods in Industrial Chemistry."

Betro's Work Reviewed

A STATEMENT from Lt.-Col. H. A. P. Disney, director of Betro, as that organisation enters upon its third year of activity in connection with the national export drive, reports a 300 per cent increase in the volume of work on hand as compared with nine months ago.

Manufacturers and business associations, says Col. Disney, are giving increasing support (membership now exceeds 300) while financial assistance offered by the Government can be called upon any time between now and 1952.

In a reference to Betro's offices overseas, emphasis is laid upon the work of the "vigorous" Washington office, and the valuable service it has rendered both to British sellers and U.S. buyers. Representatives have visited every country in Europe, except the U.S.S.R. and "two Balkan States." THE CHEMICAL AGE learns, however, that Jugoslavia and Czechoslovakia have been visited. On the question of whether Betro contemplates deeper penetrations of the "Iron Curtain" the organisation preferred to make no comment.

AVOIDABLE ACCIDENTS

PROF. T. P. Hilditch, professor of industrial chemistry at Liverpool University, told members of the Institution of Works Managers in Liverpool last week that he had been appalled at the risks of damage to property, and even to life, which existed in a number of small factories he had visited in the past few years. In many cases they arose out of some practice or mode of working. "When something does happen, it is not difficult to see how easily it could have been avoided," he said. A factory scientist could usefully be employed in tightening up conditions and in advising on precautions against accident, and especially against fire.

THE CASE FOR CONTINUOUS PROCESSES.
(*Continued from page* 135.)

plant and can therefore be more readily maintained and variations recognised and corrected.

The time taken in batch processes in charging and discharging reaction vessels or in bringing the reactants to reaction temperature varies with each process, but possibly averages 30-50 per cent of the total time. This time is saved in continuous operation and shows itself in cheaper plant.

A continuous process lends itself to heat conservation through the use of heat exchangers, the outgoing material preheating the incoming material to nearly reaction temperature.

The saving in labour, which is an outstanding advantage of continuous processes may confer no benefit in relatively small plants, in which the batch process is carried out only in day shifts, the continuous process requires three shifts in twenty-four hours. And in this connection it is perhaps not irrelevant to hope that man will not develop into a robot living a shorter life and working continuously. The bee has developed its economy to this logical end.

World News of

PROGRESSIVE POLICIES IN THE

Important Canadian Project

DR. H. J. ROWLEY, chairman of the New Brunswick Resources Development Board, has announced that Atlantic Chemicals Co., Ltd., has secured a 120-acre site, at tidal water, near Hillsboro, in south-eastern New Brunswick, with facilities for shipping by rail, sea and road. This, a $4 million project, will produce sulphuric acid, superphosphate fertiliser and Portland cement. Plenty of raw materials are available from adjacent sources. Anhydrite is at hand in sufficient quantities for many years, as well as shales and clay. In his statement, Dr. Rowley said the production of superphosphate would be sufficient to meet the demands for all three Canadian Maritime Provinces. This fertiliser had been imported from the United States for many years and its local production would be of great assistance to farmers in the Maritime Provinces as well as those now engaged in the manufacture of mixed fertilisers. The manufacture of cement would be on a relatively smaller basis. An important factor in connection with the development in that its operation could be the forerunner of an integrated chemical industry based on the known resources in New Brunswick of chemical raw materials which have, as yet, been undeveloped. Mr. S. R. Frost, wartime director of fertiliser raw materials for Canada, who has had long engineering experience in the chemical fertiliser and cement production, will be in charge while the plant is being constructed. Albert County, New Brunswick, in which the new industry will be located, has long been famous for its oil shales, until now undeveloped. For years, it has been operating scores of oil- and gas-producing wells, about a million gallons of crude oil being produced each year. The present company operating these proposes extensive developments.

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All present indications point to the fact that there will be more plentiful supplies of chemical fertiliser available in Canada this year than in 1947. This was confirmed at the last meeting of the Provincial Chemical Fertiliser Council in Montreal. Next year's production of superphosphates, estimated at about 250,000 tons, is expected to be sufficient to meet the needs of Canadian farmers. As an outcome of a new accord made with France, Canada will exchange nitrate of ammonia for potassium and will receive from France approximately 30 per cent of the potassium salts it requires —about 30,000 tons. Deliveries of chemical fertilisers are likely to be less satisfactory, the Council reveals, although the situation will be better than in 1947.

* * *

Mr. Robert Berry, president and general manager of the McArthur Chemical Co., Ltd., has acquired control of the company, which was established in 1842 and is one of the oldest concerns in Canada. Well-known in the chemical industry, Mr. Berry served for more than five years during the war in the chemical controller's office, Department of Munitions and Supply, and later as chemical administrator for the Wartime Prices and Trade Board. He joined the company in 1915.

* * *

The offer is being made of an issue of 12,500 shares of the McArthur Chemical Co., Ltd., 5 per cent cumulative sinking fund redeemable preferred stock, $20 par value, at $19 per share, with a preference yield of approximately 5.26 per cent. The company has secured a noteworthy increase in profits in the current year. In the ten months ended October 31, 1947, operating profit amounted to $91,987 as compared with $65,523 for the full year 1946 and, after all charges, net income was $44,892, against $29,566 for the full year 1946.

S. African Technology

TRAFFIC signs, centre lines and danger points in South African cities are being given coats of a new plastic paint which contains thousands of glass particles acting as mirrors. The paint is obtainable in a variety of colours and manufacturing costs are believed to be little more than those of ordinary paint. Tests have shown it lasts much longer than non-plastic paint.

* * *

Aircraft engaged in anti-locust operations in central Rukwa have achieved complete success by spraying 14,000 acres of the Milpa area with the new insecticide DNOC, supplies of which were obtained following unsatisfactory results with Gammexane sprayed from altitudes as low as 50 ft. According to some reports, 100 per cent mortality resulted when

Chemical Industries

COMMONWEALTH COUNTRIES

settled swarms and lesser adult concentrations were sprayed.

* * *

Shareholders of Anglo-Alpha Cement, Ltd., are to be asked to approve an increase in the authorised capital of the company from £2,250,000 to £3,500,000 by the creation of 5 million shares of 5s. each to be issued with or without deferred rights. By a provisional agreement, Holderbank Financiere Glarus, Switzerland, will acquire a big share interest in Anglo-Alpha Cement, which itself will acquire from Holderbank 90 per cent of the issued share capital of National Portland Cement Co. (Pty.), Ltd., whose factory is near Cape Town. One development will be the erection at Ulco, some 50 miles west of Kimberley, of an up-to-date factory capable of producing 200,000 tons annually.

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Dr. J. O. Cutter has been appointed director of the Paint Research Institute to be established in Durban at the Natal University College. The cost of the erection of a building for the Institute is to be borne by the paint and allied industries and the Union Government. The industry and the Council for Scientific and Industrial Research will bear the running costs of the Institute of £5000 a year for the next five years.

New Indian Chemicals

THE production of synthetic phenol is engaging the attention of the Government of India, and a tentative scheme to use the benzene sulphonation method has been put forward. Capital outlay for a plant capable of producing 10 tons per day is estimated at Rs.120,000, and the estimated cost of production is about Rs.65 (nominally 97s. 6d.) per cwt., which compares with imported phenol at Rs.85 to Rs.90 per cwt.

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A detailed survey of all the aromatic plants in India, estimated to number over 1300, has been suggested by the *Journal of Scientific and Industrial Research* with a view to making the country independent of foreign supplies. The demand for varied and delicate perfumes is bound to increase with the development of India's æsthetic sense and the advancement of science and a rising standard of living. Essential oils will also offer important possibilities for the destruction of animal, agricultural and forest pests.

* * *

A process has been developed by Sir J. C. Ghosh and his collaborators at the Indian Institute of Science, Bangalore, for obtaining an acetylene-based synthetic rubber product, which is superior to natural rubber in ageing properties, resistance to solvents and permeability to gases. It resembles completely vulcanised soft rubber, is pale yellow in colour, and transparent, resilient and elastic.

* * *

A recent announcement of the Travancore Government points out that some time ago when deciding on a programme for the industrial development of the State, it decided that not only should some of the processing of mineral sands be carried out in the State itself, but that attention should also be turned to manufacture of finished products. In future, therefore, all the mineral sands of Travancore are to be regarded and declared as the exclusive property of the Government, and the mining, dressing and sale of the sands including ilmenite, sillimanite, zircon and rutile, but excluding monazite, will be carried out by the existing four companies solely as the agents of the Government.

* * *

In collaboration with the Travancore Government and the British Titan Products Co., Ltd., and four existing Indian companies, a company called the Travancore Titanium Products, Ltd. (to be incorporated in Travancore) is to establish a factory for the manufacture of titanium pigments. British Titan Products Co., Ltd., will form a subsidiary company known as Indian Titan Products Co., Ltd., which will act as managing agents of Travancore Titanium Products, Ltd. These arrangements exclude monazite, which, in view of its importance in connection with atomic energy research on thorium, stands on a separate and independent footing. However, in respect of monazite also, the Government is arranging for the establishment of a processing factory in Travancore in collaboration with a British firm.

Swiss Export Problems

BECAUSE of the pronounced world-wide revival of economic nationalism which has brought with it a large number of pro-

(*Continued overleaf*)

hibitions or restrictions on the import of so-called "unessential" goods, Switzerland's chemical and pharmaceutical industry is reckoning with increasing difficulties in foreign markets, states the December bulletin of the Swiss Credit Institute in its annual survey of Swiss economic developments in 1947.

The full significance of this development is better understood when it is remembered that from one-sixth to one-fifth of total Swiss exports of manufactured goods is accounted for by the chemical and pharmaceutical industry. For the past year, this figure totals over 500 million Swiss francs.

In the earlier part of the year, the large volume of accumulated orders from foreign countries led to a further increase in shipments, but this development was more than counterbalanced in the second half by such events as the almost complete cessation of trade with Sweden, an important importer of Swiss coal-tar dyes. The Swiss dyestuffs industry, one of the most important sections of the chemical industry, is stated to have received preferential treatment in the allocation of import licences and foreign exchange. However, in spite of this, such important markets as Great Britain, Canada, and China substantially reduced their takings.

* * *

The pharmaceutical industry reports an overall increase in exports, but at prices out of all proportion to the increased cost of production. Morever, lack of foreign exchange and particularly of "hard" currencies abroad, led to the establishment or expansion of national pharmaceutical industries with the active support of the respective Governments.

* * *

Exports of auxiliary products for the textile, leather and paper industries developed much less favourably than those of dyes and pharmaceuticals. The cost of the raw materials for insecticides steadily increased, while prices of the agricultural products to be protected failed to rise in proportion. However, it is stated that Swiss research activity in this sphere was directed to entirely new ways and means of developing new markets.

Italian Fertiliser Prospects

THE present potential capacity of Italian plants for the production of mineral superphosphates amounts to some 2 million metric tons a year. As their pre-war capacity amounted to 2.3 million tons much has evidently been accomplished in the way of reconstruction. Italy is in fact now only 13 per cent below her pre-war standard and there are good reasons to expect that during 1948 even this small discrepancy will be eliminated.

The country's requirements of mineral superphosphates does not reach this figure. During the five-year period from 1936 to 1940 a yearly average of 1.46 million tons of this fertiliser were consumed in Italy. The consumption is now likely to be higher, possibly 1.6 million tons.

As far as the superphosphates for the home consumption are concerned, Italian factories are favouring products with a high P_2O_5 content. Transport charges are high and all the interested parties are anxious to reduce the bulk of transported products as far as possible.

Italian exports of superphosphates are technically possible. The chief problem will be the provision of sufficient extra raw material.

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The situation of nitrogen fertilisers is of a different character. Existing factories are capable of producing some 200,000 tons of nitrogen yearly. About 20,000 tons of this are needed for industries and 180,000 tons are left for fertilisers. It is difficult to estimate the present needs of Italy in this field. The maximum figure registered was 152,000 tons in 1939. The nitrogen needs of the country, however, have greatly increased. In 1948 practically the whole of the 180,000 tons of nitrogen could readily be used. In Italy, however, as new plants with a total capacity of some 100,000 tons are planned, a possibility of exporting substantial quantities of nitrogen is revived. The countries around the Mediterranean supply sufficient markets.

In this case raw materials present no particular difficulty and the whole problem is to secure enough power, coal, gas, coke or electricity, with which to run the plants.

Before the war the maximum annual consumption of potassic fertilisers reached about 100,000 tons, with preference for 40/42 K_2O content. This quantity was almost entirely supplied by the countries of Central Europe. As soon as the circumstances permit, these imports will have to be resumed and probably increased somewhat if the new criteria of fertilising, now appearing in Italy, are established.

* * *

Before the war about 125,000 tons yearly of copper sulphate were produced in Italy and this was sufficient to cover the needs of local agriculture, the modest demand on the part of some industries, and exports to near-by countries.

The present needs of Italy in copper sulphate are calculated at about 100,000 tons yearly. This requires about 25,000 tons of copper which have to be imported from extra-European countries.

THREE-YEAR CHEMICAL PLAN

Poland's Rapid Advance to Export Production

MORE organic chemicals; more finished or semi-finished products; fewer raw materials. That briefly summarises Poland's chemical export policy in the next few years envisaged by the current three-year State production plan (1947-49). A full-length survey of this has now been made available in a publication lately received from the "Western Press Agency"—a Polish journalists' co-operative organisation sponsored by Polish authority.

This very comprehensive review of chemical industry in the war-shattered areas, its partial recovery and prospects, takes an optimistic view of development which State chemical enterprises are intended to achieve in the next three years, but does not disguise the widespread disintegration which characterised the industry at the end of the war.

THIS YEAR'S EXPORTS

THE plan for exports in 1948 of chemical products from Poland anticipates the value of exports of inorganic chemicals will be over $5 million, i.e., 38.5 per cent of the total.

The most important items will be: 15,000 tons of ammoniacal soda, 12,000 tons of caustic soda, 1000 tons of acetylene, 2700 tons of sulphur, 4000 tons of soda, 2000 tons of calcium chloride and 1300 tons of copper sulphate.

The second group of chemicals to be exported are paints and varnishes, to the total value of $3,200,000, i.e., 24 per cent of the total. In this group the main articles are: zinc oxide—10,000 tons, lead litharge—850 tons, red lead—150 tons.

Exports of organic chemical products of a value of about $3 million, i.e., 22 per cent of the total, will include 15,000 tons of 98 per cent benzene, 5000 tons of carbon electrodes, 2500 tons of raw coal tar and 6000 tons of charcoal.

55 Per Cent Total Losses

The total losses of the chemical industry in the recovered territories, it records, amount to 55 per cent. The Polish authorities who took over chemical establishments were able to start up only a small proportion of the factories. Half of them needed essential repairs, and approximately 25 per cent had to be entirely rebuilt.

The inorganic chemical industry suffered relatively less destruction—amounting to 45 per cent. Two of the largest chemical factories: "Silesia" in Zarow, near Swidnica, producing sulphuric acid, chlorhydric acid, ultramarine and green paint and the "Arsen" factory in Równe—Zabkowice (district which produces arsenic combinations) sustained only slight damage, but out of five superphosphate factories and the I.G. Farbenindustrie combine in Kedzierzyn, only one factory in Ubocz (Swidnica district) was saved. The remaining factories were on an average 70 per cent destroyed.

Rapid Recovery

Figures of reconstruction published appear to reflect a remarkable degree of recovery within a comparatively short space of time. Of 64 chemical works taken over in the recovered territories, 15 are stated to have been in production by September, 1945; 33 were put under extensive repairs and the remaining 16 needed to be entirely reconstructed.

At the same time the repair and reconstruction of other damaged establishments of the chemical industry went ahead rapidly. As a result of this effort approximately 34 factories, i.e., 65 per cent of all establishments taken over in the recovered territories started production in June 1946. The degree of reconstruction work in the different branches of the chemical industry is as follows:

No.	Industry	Total	Working	Ready to work	Under repair or reconstruction	Requiring complete rebuilding
1.	Inorganic ...	7	5	—	1	1
2.	Artificial fertilisers	6	2	—	2	2
3.	Organic and pharmaceutical ...	9	5	—	2	2
4.	Coke-chemical ...	14	9	1	—	4
5.	Rubber and artificial building materials	3	1	—	—	2
6.	Oil manufacture ...	8	6	—	1	1
7.	Paints and varnishes	5	4	—	1	1
8.	Applied chemistry	3	2	—	1	—
	Total ...	55	34	1	8	12

According to this semi-official Polish survey, chemical works in the recovered territories were producing in August 1945 goods worth $42,023, equivalent to 1.5 per cent of total Polish production; in March

1947, the total is stated to have risen to $1,560,577, or 17.9 per cent.

Notwithstanding considerable difficulties in starting up the chemical industry, the factories in the recovered territories were able to begin exporting their production on a small scale. The first goods exported were carbon electrodes, red lead and arsenic. As early as in 1946—150 tons of red lead were exported to the U.S.S.R. and an equal quantity to Denmark, also 50 tons to Sweden.

So far, the chemical exports, apart from carbon electrodes, have been limited to raw materials. Export of refined products, including products of the organic chemical industry, will only be realised when Polish industry is completely restored.

Until now Poland has had to import many of the supplies necessary to chemical production and to export unfinished coal by-products, owing to the lack of transportation workshops. The three-year plan aims at establishing in Lower Silesia a base for organic chemical industry in view of the superior quality of Lower Silesian coke and coal and the wide development of the local coke-chemical industry.

This will make it possible for the organic chemical industry to supply large quantities of organic semi-finished and finished products to the various chemical factories, thus transforming not only the character of the entire Polish organic-pharmaceutical industry but its position in the world.

On the one hand, this industry will have its base for raw materials considerably enlarged, and on the other, instead of exporting coal by-products of little value, such as benzol, tar, pitch, etc., it will send abroad finished organic products of greater worth.

Organic Chemicals

With this aim in view it was decided to start up, as soon as possible, the large organic chemical plants, severely damaged by war operations, in Brzeg. The former "Anorgana" factory (now renamed "Rokita") will be the main factory for organic chemical semi-finished products (based on the first manufacturing stage of chloric action on benzol and toluol) of primary importance in the manufacture of artificial textile-rayons, and ethyl derivatives including acetic and phthalic acids. This plant will start production before the end of the year and its total monthly production will exceed that of the entire organic-pharmaceutical industry of Poland to-day. The big carbon electrode factory "Plania" in Raciborg will also be enlarged.

The next task foreseen in the three-year plan will be the building of a third large fac-

(*Continued in next column*)

POLISH CHEMICAL OUTPUT

EVIDENCE that the Polish chemical industry is achieving better production figures is contained in the official record of output during October, 1947. No less than 11 of the commodities listed in an official notice from the Polish Embassy in London show increases compared with the September figures. The most marked rise was in the production of saltpetre fertilisers—7613 tons compared with 3605 tons. Paints and varnishes, and hydrochloric acid also showed considerable advances. Falling off in production was pronounced only in superphosphates —11,101 tons as against 17,195 tons.

The list (in tons) is as follows: Tar products 14,036, benzene products 3151, carbon electrodes 561, organic dyestuffs 212, oil paints and varnishes 272, zinc oxide 730, ultramarine 46, potassium nitrate 10,929, saltpetre fertilisers 7613, superphosphates 11,101, hydrochloric acid 380, sulphuric acid 4978, ammonia 551, ammoniacal soda 8184, caustic soda 3010, acetylene 2572, soap 800, rubber footwear 110, tyres and tubes 338.

Aluminium and Dollars

IN the course of his address to the ordinary general meeting of Birmid Industries, Ltd., at Birmingham, recently, Mr. Cyril C. Maudsley, chairman, said the aluminium supply situation was not a clear one, because the bulk of U.K. requirements came from Canada, and had to be paid for in dollars. He felt, however, that the Government fully appreciated the vital importance of the aluminium fabricating industry to the national economy, and that nothing but the most desperate need would influence the authorities to cut down supplies of aluminium used in essential industries.

tory in Poland for nitrogenous compounds, based on what remains of the huge synthetic fuel plants at Kedzierzyn and Blachownia. Current Polish needs of nitrogenous fertilisers are 150,000 tons, of which existing production meets only about 10 per cent.

Total chemical production in all Polish territory will in 1949 exceed 1938 production by more than 100 per cent, the report confidently predicts.

"The value fixed for chemical production in the recovered territories for the years 1947, 1948 and 1949 will amount accordingly to $21,000,000, $36,150,000 and finally to $53,150,000." The targets announced for 1949 for the two most important sections, coke chemicals and the oil industry, are respectively $28.5 million and $6.058 million.

American Chemical Notebook

From Our New York Correspondent

ALTHOUGH production generally continues at a high level, a survey of 35 chemicals made by the Bureau of the Census of the U.S. Department of Commerce reveals that 20 of the 35 were produced in smaller volume in November 1947 than in October and nine were produced at a lower rate than in November 1946. Among the chemicals whose production in November was less than in October were the ammonia compounds, calcium phosphates, phosphoric acid, tetra sodium phosphate, chrome colours and chemicals, Glaubers' salt, chlorine, soda ash, caustic soda and sulphuric acid. Of these, only synthetic ammonium sulphate and the calcium phosphates were produced at a lower rate this November than in November a year ago. Other chemicals whose current output is below last year include calcium carbide, chrome green, lead arsenate, silver nitrate and sodium bicarbonate. Outstanding production increases were registered for hydrogen and nitric acid. Hydrogen production rose in November for the seventh consecutive month and output totalled 2103 million cu. ft. and nitric [illegible] production rose to a record high level of 67,996 tons.

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Repercussions of the announcement that the U.S.A's share of the world allocations of tin metal in the first half of this year is 17,703 long tons have been a number of restrictions on use. The Department of Commerce has already announced that an order will be issued at the end of this month restricting the use of tin cans by a number of industrial users. Shipments of tinplate to other countries in April, May and June are also to be reduced to 112,000 tons—8000 less than the first quarter's exports in 1947. In 1946, the fifth year of tin shortage, world production is stated to have risen only six per cent.

* * *

Given "reasonable world stability," chemical production in the United States during 1948 may well surpass the record high level of last year and set new achievement records, Mr. Charles S. Munson, president of the Manufacturing Chemists' Association declares in a report to the American Chemical Society. During the first ten months of 1947, the Federal Reserve Board index of industrial chemical output averaged 431 per cent of pre-war production, reaching a peak of 439 in one month as compared with the wartime record of 412. While no official figures for 1947 are yet available, the report by Julius A. Krug (Secretary of the Interior) on national resources and foreign aid estimated production of chemicals and related products for the year at $7,514,500,000 as compared with $7,440,100,000 for 1946, he points out. As the world's largest producer, consumer and exporter of chemical products, the United States also established a record last year for expenditures on chemical research, Mr. Munson states, noting that the industry's average research expenditure amounted to between 2 and 3 per cent of total sales, with some companies spending more than 5 per cent. During 1947, with an estimated total United States outlay of $1,160 million for research and development (excluding atomic energy), industry spent approximately 39 per cent and Government 54 per cent. Discussing the possible impact of the Marshall Plan on the chemical industry, Mr. Munson anticipates that Government requirements will be considerably lighter in this field than in some other industries, since many of the chemical products needed by European countries, such as alkalis, are also in high demand here.

* * *

A new patent process for the electrodeposition of iron, No. 2,420,403, granted to the Champion Paper & Fibre Company, Hamilton, Ohio, has just been made available for licensing or sale. The patent provides an electrolytic bath by means of which fine-grained iron deposits may be obtained by passing an electric current through a ferrous chloride solution to which manganous chloride or manganous sulphate has been added as a catalytic refining agent. The catalytic agent comprises not more than 20 grams per litre in a bath containing about 300 grams of ferrous chloride. The temperature of the bath is maintained between 160-220° F.; the *p*H value between 1 and 3. The inventor claims that the deposit obtained is smooth, strong, and ductile and does not require the later heat treatment necessary with previous processes. The U.S. Patent Office has also announced that Patent No. 2,043,284, for the production of chlorine dioxide, has likewise been made available for licensing or sale by the Mathieson Alkali Works, Inc., 60 East 42nd Street, New York 17, N.Y. This patent provides a convenient and economical method of producing chlorine dioxide which is obtained by the reaction of chlorine gas passed through a watery solution of sodium

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chlorite. The chlorine supplied to the reaction is diluted with air or nitrogen so that the chlorine dioxide obtained is in a substantially dilute form which may be used in such operations as the bleaching of flour.

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The Monsanto Chemical Company's sales for 1947 were approximately 140 million dollars, the highest figure in its history, William M. Rand, president, has announced. Prospects, he said, favoured a good year for the company in 1948, but warned that higher operating costs and rising freight rates acted as a brake on earnings, in view of the moderate price advances in Monsanto's products. Commenting on the company's expansion programme, Mr. Rand said, "We projected $50 million for 1947 and 1948. About 22 million dollars were expended in the past year and nearly 30 million dollars more will be spent on new construction in the current year." The company also announced this week that it has arranged through a group of banks for credits up to $25 million for three years' development.

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A further new product, "Ludox" colloidal silica, a fluid, opalescent aqueous dispersion containing the elements of common sand in a relatively high state of purity and in a finely divided form has just been announced by E. I. du Pont de Nemours. Until recently, commercial silica sols and gels have been prepared chiefly by the reaction between aqueous acids and sodium silicate solutions. Sols prepared by this method are high in salt content, making them unsuitable for use in many applications. "Ludox" sols are prepared by a patented process involving the reaction of aqueous sodium silicate with a cation or base exchange resin and are essentially salt and sodium free. The new colloidal silica is highly fluid, even in concentrated form, and on drying yields substantially pure silica in the form of thin films or finely divided, discrete particles which cannot be re-dissolved in water. The individual particles of silica in "Ludox" are exceedingly small. When dried and examined by means of the electron microscope they are found to have a diameter of less than one-millionth of an inch. In this respect they resemble the finest particles hitherto known, such as the carbon blacks produced by the combustion of natural gas. The new product is expected to find wide application in the compounding of rubber, for the surface treatment of paper, in leather dressings, and for other industrial uses.

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A completely new pocket thermometer, a "watchmaker's reduction," pencil sized, of the Weston Testing Thermometer, has been announced by Scientific Glass Apparatus Co., Inc., Bloomfield, New Jersey, and since it is of unbreakable construction, it is expected to find wide application where a product might be ruined by the breaking of a mercurial thermometer bulb. Incorporating all the features of larger models used in many laboratories, the new thermometer is of stainless steel and its accuracy is guaranteed to ½ of 1 per cent of the entire scale range. It is being made in four ranges, 0-220°F., 50-500°F., 0-150°C. and 0-250°C.

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Abandonment of fourteen military bases in the Panama Canal area has deprived the U.S. Army Chemical Corps of its last testing ground for poison gases and other war chemicals, according to the American Chemical Society's *Chemical and Engineering News*. When the Panama National Assembly voted in December to reject a proposed treaty covering the bases, the list of installations lost to the United States included the tiny, isolated island of San Jose, fifty miles off the coast of Panama. The American Army had acquired this island in 1942, and had developed it into a $10 million proving ground for new types of toxic chemicals and gases, as well as those captured from the German Army. All similar proving grounds were shut down, the journal says, so that loss of this base "will have a direct effect on the chemical research and development programme of the Army."

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Mr. Granville M. Read, chief engineer of E. I. Du Pont de Nemours & Co., Inc., addressing the annual dinner of the Charlotte (North Carolina) Engineers' Club last week, declared that technological advances achieved as a result of the recent war will cause some plant owners "to be rudely awakened to the fact that they cannot make money in the markets of 1950 with the products and plant facilities of 1920 or 1930." It was, he said, the task of engineers to bring industry's attention to the aspects of production and distribution "that cannot meet competition," and observed that "obsolescence to-day is at an all-time peak." Mr. Read urged industry to maintain first rate technical staffs. "Experience has shown," he said, "that each dollar spent for research leads eventually to about $3 of expenditure for plant construction. It is highly important that this construction be so well planned and executed that a profit is earned at reasonable sales prices and obsolescence is not unnecessarily rapid."

A CHEMIST'S BOOKSHELF

The Kinetics of Reactions in Solution. E. A. Moelwyn-Hughes. Second edition. London. Oxford University Press (Geoffrey Cumberlege), 25s. Pp.viii +424.

Anyone interested in the field of chemical kinetics is familiar with the work of the author, both through the first edition of this book, and from his many published papers dealing with the kinetics of organic reactions. The present edition is very much enlarged, since it deals not only with the fundamentals dealt with in the first edition, published in 1933, but also with the many new aspects of the subject which have developed since that year. Although the collision theory was first applied to reactions in the gas phase, most chemical reactions with which we are normally concerned take place in solution. It is therefore of first importance for the development of fundamental chemistry to be able to understand the mechanisms governing reactions in solution. Reactions between polar molecules, between ions, and between representatives of these two groups are all dealt with, and a separate chapter is devoted to equilibria in solution. Although the book is mainly illustrated by reference to the reactions of organic chemistry, those interested in many applied branches of chemistry involving high pressure work, reactions in smokes, the behaviour of enzymes, and the coagulation of colloids, to take only a few examples of topics, will find much of interest and of importance for the further understanding of their chosen field. The discussions are clear, and do not, on the whole, demand any further mathematical competence than is normally considered to be the equipment of the average chemist of to-day. An extensive bibliography is not the least of the satisfying points of the book. The publisher's imprint is sufficient guarantee of the excellence of the production, which matches that of the contents.

Synthetic Resin Chemistry. By S. R. W. Martin. London: Chapman & Hall, Ltd. 1947. Pp. 160. 15s. net.

Amid the super-abundant literature on plastics in books and journals, the present book is commendable for its value to students. It is primarily written as a textbook for those attending classes in resin, paint or plastic technology, and for young workers in laboratory or factory handling plastics and synthetic resins. Each of the fifteen chapters begins with theoretical considerations followed by a practical section including experiments which are easily carried out. An introductory chapter presents an outline of the various classes of organic chemicals met with in the resin industry. Thirteen figures, eleven tables, many diagrams and numerous formulæ, as well as a detailed subject index, fit this book to serve as an adequate textbook for students and a primer in their laboratories. This is the seventh of the books covering various aspects of this rather young industry which Chapman & Hall have provided.

Buna Rubber. By Frank A. Howard. New York. D. Van Nostrand Company, Inc. Pp. XII + 307. 21s.

This is an engrossing record of the events that attended the growth of Buna production from the days when the beginnings had to be made from foreign patents and research to the present when it ranks as an industry of far-reaching importance to the U.S.A. and a great new factor in world trade. It chronicles the enormous strides taken under the pressure of wartime emergency to relieve the threatened rubber famine. It is a factual narrative written from the front lines of the new industry, by the man who has been a principal in synthetic rubber development and who has guided it from its earliest days into the main stream of industrial progress.

MORE MAGNESIA

IN his annual review of the activities of Turner & Newall, Ltd., and subsidiary companies, Mr. W. W. F. Shepherd, chairman, stated that during the year under review the Washington Chemical Co., Ltd., had not been affected to any considerable extent by shortage of electric power, though less, and inferior quality, coal had occasioned some difficulties.

The sea water magnesia plant, installed and operated during the war to produce synthetic calcined magnesite for Government purposes, had now been switched to peacetime production, and had yielded a substantially increased volume of all grades of magnesia.

PERSONAL

VISCOUNT BLEDISLOE, vice-president of the Parliamentary and Scientific Committee, has asked to be allowed to retire. His successor will be chosen at the annual meeting on February 5.

MR. J. ARTHUR REDFERN has retired from Redfern's Rubber Works, Ltd., Hyde, Cheshire, after 41 years' service. For the past 28 years he has held the position of works managing director and succeeded his brother, Mr. Wilfred E. Redfern as chairman in 1941.

MR. H. B. HENBEST has been elected to a Beit Fellowship for Scientific Research. The award, which is valued at £400 per year, and is tenable at the Imperial College of Science and Technology, is for research in organic chemistry under the direction of Sir Ian Heilbron.

MR. THEODORE F. NESSLER has been appointed to the newly created post of purchasing manager for the chemical department of the (U.S.) General Electric Company. For the past eight years, Mr. Nessler has been in charge of purchasing of chemicals, castings, factory and foundry supplies for the company.

PROF. MARCUS L. E. OLIPHANT, F.R.S., has been awarded the 26th Faraday Medal of the Institution of Electrical Engineers "for his distinguished work in nuclear physics and his original discoveries in the physical sciences, particularly in the realm of electromagnetic oscillations, their production, study and use."

DR. EMIL OTT, director of research of the Hercules Powder Company, Wilmington, Delaware, has been elected to the board of directors of the American Chemical Society for a three-year term. He succeeds DR. EDWARD R. WEIDLEIN, director of the Mellon Institute for Industrial Research, Pittsburgh, Pa., as Regional Director for the district embracing the States of Pennsylvania, Ohio and Delaware.

MR. NORMAN HILL, who, since 1939 has been assistant managing director of County Perfumery Co. (Beecham Group), has been released from his post to become general sales director of County Chemical Co. This change is consequent upon Mr. Wilfrid Hill (founder of both companies) having decided to take only a still smaller interest in County Chemicals. He is 80 years of age and retired from active business some years ago.

Triplex Glass Appointments

The following employees of Triplex Glass Co., Ltd., have been appointed to the board of that company:—

MR. A. C. WAINE, 41-year-old chief chemist, who joined the company in 1933 as a junior chemist.

MR. C. L. CRIPPS, manager of the safety-glass factory, Willesden.

MR. H. W. BAKER, 46-year-old chief engineer, who joined Triplex in 1926.

MR. A. G. ROSE, 49-year-old general manager of the King's Norton works, which he joined as secretary in 1929.

MR. J. W. FOLLETT, general sales manager, and formerly a director of Protectoglas, which was taken over by Triplex in 1933.

It is also announced that MR. ARTHUR COCHRANE, who has been a director of Triplex since 1935, is promoted assistant managing director. He is 52 and joined the firm in 1929, becoming works manager in 1932.

Textile Institute Appointments

The Textile Institute has announced the election of four new Fellows as follows:—

MR. W. PENN, head of Courtauld's Dyeing Department, Coventry.

MR. JOHN DAY, manager and director of Mark Day, Ltd., and

DR. J. G. MARTINDALE, Principal of the Scottish Woollen Technical College, Galashiels.

MR. WALTER TAUSSIG, chemist and technical representative of the Clayton Aniline Co., Ltd., Manchester.

New Associates also announced are: DRS. K. I. NARASIMMAM and S. H. MHATRE (both of Bombay), MR. W. G. WEBSTER (London, W.2), MR. J. H. WOLSEY, (Otley, Yorks), and MR. L. COLLINS (Alexandria, Egypt).

Obituary

DR. C. A. MITCHELL, a former editor of *The Analyst*, has died at the age of 80.

DR. ERNST PREISWERK, who for many years was head of the research laboratories of Hoffmann-La Roche & Co., Ltd., died in Basle after a long illness. He was 70.

The death has occurred at Motherwell of MR. JAMES COLVILLE, a director of the Clyde Alloy Steel Company, Ltd. Mr. Colville, who was 54, joined the staff of the Clyde Alloy Steel Company in 1921. He was appointed a director in 1936.

Home News Items

Spanish Zinc for Britain.—A cargo of about 4000 tons of zinc concentrate will shortly arrive at Swansea from Spain, and it is said this will be the forerunner of similar shipments.

Conservancy Board Sues a City.—Alleging that pollution of the River Wye by the city's sewage killed 276 salmon last summer, the Wye Conservancy Board has filed an action against Hereford City Council.

British Petroleum for Argentina.—It has been reported that at a meeting between British and Argentine trade negotiators in Buenos Aires last week, it was agreed that Britain would supply Argentina with petroleum.

Another Refinery.—Engineers and technicians of the Shell Oil Company were expected to take over this week the Ministry of Supply war-time petrol refining factory at Heysham, near Morecambe, to prepare for its re-opening. The factory, stated to have cost over £12 million, has been idle for more than a year. One of the biggest refineries in the country, it was used during the war for refining high-grade aviation fuel, and at peak periods more than 3000 were employed there.

Manchester University Achievement.—Professor P. M. S. Blackett, Manchester University nuclear physicist, speaking at Manchester last week, described as "quite important" the discovery of two new types of particles in the atom by Dr. G. D. Rochester and Dr. C. C. Butler, Lecturers in Physics at Manchester. Dr. Rochester said that an investigation had been undertaken during the past twelve months into the nature of penetrating particles occurring in cosmic ray showers at sea level, and the discovery had come about as the result of taking photographs of cosmic rays in a cloud chamber.

Former I.C.I. Factory.—Efforts are being made in Hawick to bring into use again the Newtown St. Boswells' £1 million war-time chemical factory of I.C.I., Ltd. Since the end of the war this important factory has been used for a variety of purposes, including the storage of prefabricated houses. The factory is excellently equipped, with internal railways and ample modern facilities. Its neglect since the end of the war is now being taken up strenuously by the Edinburgh and District Committee of the Scottish Board for Industry. It is hoped that their recommendations will lead to a revival of production.

1947 Steel Achievement.—According to figures issued by the Iron and Steel Federation, the British steel industry in the 53-week year, produced 12,724,000 tons in 1947, thus exceeding its target by 224,000 tons.

Australian Lead for U.K.—The Australian Government is reported to have authorised the export of 50 per cent of its holdings of scrap lead to Britain to reduce Britain's dollar purchases from Canada and Mexico.

Cement Prices Up.—A further rise in the price of Portland cement of 1s. per ton, plus another 1s. per ton for delivery in paper bags, has been authorised by the Ministry of Works. The increase is stated to be due to higher fuel, freight, and paper costs.

Gauge and Tool Exhibition.—The 1948 Gauge and Tool Exhibition—the second of its kind—will be opened on January 26 by Mr. Oliver Lyttelton at the New Hall of the Royal Horticultural Society. Organisers are the Gauge and Toolmakers' Association and the National Federation of Engineers' Tool Manufacturers. There will be about 90 exhibitors.

S.C.I. Meeting in Edinburgh.—The annual general meeting of the Society of Chemical Industry will be held in Edinburgh from July 12 to 17. The historic Assembly Rooms and Music Hall in George Street, have been engaged for the occasion, enabling the principal functions, including meetings, lectures, receptions, banquets and dance to be held under the one roof.

Post-Graduates at Glaxo Laboratories.—A party of 25 post graduates from the Imperial College Chemical Society last week visited Glaxo Laboratories and were received by Mrs. R. Denston, B.Pharm., Ph.C., and conducted on a tour. They were able to see something of the work carried on in the chemical research, penicillin assay, microbiological assay, micro-analysis, electrophoresis, biochemistry and nutrition sections of the factory.

Colvilles' New Furnace.—One of Scotland's most modern blast furnaces was "blown in" on January 12 at the Clyde Ironworks (Tollcross, Glasgow), of Colvilles, Ltd. It has a weekly capacity of about 4500 tons of pig iron and has been installed at a cost of about £500,000. Although completed several months ago, the furnace could not be operated before because supplies of coke were sufficient only for the company's two other furnaces. Combined furnace capacity now amounts to about 8000 tons of pig iron per week.

Technical Publications

FIFTY years is not an inconsiderable period of time to have been engaged upon the production of mechanised mining equipment. This record assumes an even greater significance when it is realised that mechanisation is generally of relatively recent origin in British mines. To celebrate the jubilee of its foundation, British Jeffrey-Diamond, Ltd.—founded in 1897 by Mr. (later Sir William) Garforth to develop and manufacture a mechanical coal cutter—has produced an attractive booklet dealing with the company's products, history, and achievements.

* * *

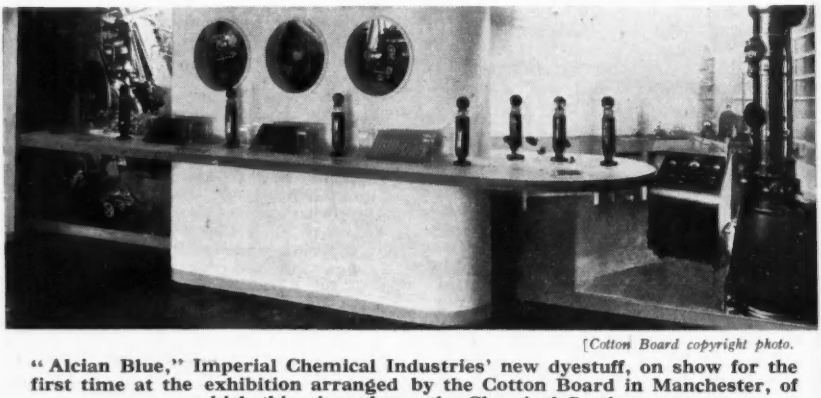
Chemical Safety Data Sheets SD-18 covering ethylene dichloride, and SD-19 covering dimethyl sulphate, have just been issued by the Manufacturing Chemists' Association of the United States. The manuals are designed for supervisory staffs and management, and present essential information for the safe handling and use of these chemical products. Important physical and chemical properties and other information outlining shipping containers and methods for unloading and emptying, container storage and handling, and recommended personal protective equipment are included. Copies may be obtained from the Manufacturiang Chemists' Association, 608 Woodward Building, Washington 5, D.C., price 20 cents.

* * *

A general bulletin, listing the various products which are now supplied by the Chemical Division of the Koppers Company, Inc., has just been released. The products of the Division are synthetic organic compounds derived from the coal chemicals and the bulletin presents the properties of the compounds, their chemical reactions, and the more general uses of the various materials. Among the chemicals listed some may not be known as generally available on a commercial scale. They include: dihydroxydiphenyl sulphone, di-tert-butyl-meta-cresol, mono-tert-butyl-meta-cresol, di-tert butyl-para-cresol, hydrogen cyanide (industrial grade), beta-methyl umbelliferone, and beta-resorcilic acid. Copies of the bulletin, No. C-7-103, may be obtained from the company's chemical Division, Pittsburgh 19, Pa.

Spatter Protectors

A persistent problem in the welding industry is the protection from spatter of the coloured filter glass in the operator's helmet or handscreen. Since filter glass is comparatively expensive, and a badly spattered glass prevents good visibility and leads to bad welding, Murex Welding Processes, Ltd., has sought to overcome this difficulty by introducing "Perspex" covers. Made from a special grade of perspex, the cover is placed in front of the coloured filter glass which it protects for a considerable time, even under conditions of very close welding. The manufacturers claim that with reasonable care, these covers will have a longer life than any form of glass protector, over which they have the added advantage of being unbreakable.



[Cotton Board copyright photo.

"Alcian Blue," Imperial Chemical Industries' new dyestuff, on show for the first time at the exhibition arranged by the Cotton Board in Manchester, of which this view shows the Chemical Section

Overseas News Items

Uranium and Plutonium in China.—Uranium- and plutonium-containing minerals have been discovered in East Kwangsi Province, China.

S.W. African Vanadium.—The South West Africa Co., Ltd., states in its report for the year to June 30, 1947, that a new deposit of lead vanadium mineral is being opened up to the west of its main Abenab mine.

Swiss Credit for French Coalmines.—With the approval of the French and Swiss Governments, the French coalmining industry has just been granted a total credit of 10 million Swiss francs by two leading Swiss banks. The money is to be used for the purchase of Swiss and U.S. mining equipment and machinery.

Turkey Plans Higher Iron and Steel Production.—The Karabuk Iron and Steel Works are reported to be planning to increase output by one-half next year to reduce the need for shipments from abroad. Annual output is at present estimated at about 219,000 tons of pig iron and 171,900 tons of steel ingots.

Aluminium Oil Pipelines.—A new application for aluminium has been found by the U.S. Reynolds Metals Co., which is stated to be developing an aluminium pipe for oil, natural gas and petrol. The development may be due to the pronounced steel shortage. A number of inquiries from foreign oil producers are said already to have been received by the company.

Holland May Export Fertilisers.—Two Dutch enterprises—Mekof of Ymuiden, a concern associated with an Ymuiden steel company, and the Nitrogen Industry Co. of Luuterade, owned by the Dutch State Coalmines—are planning to expand ferti'iser manufacturing capacity to cover domestic needs about 150,000 tons annually—and provide an export surplus.

New Egyptian Oil Field.—Further details have just been published in London by the Petroleum Press Service on the Anglo-Egyptian Oilfields Company's new field in the Sudr District of the Sinai Peninsula, where production at a daily rate of 5000 barrels started a little while ago after exploratory drilling activities occupying nearly two years. The area is being developed jointly with the Socony-Vacuum Oil Co. and it is reported that six wells have thus far been drilled, of which five were producers. The field is located about five miles from the Gulf of Suez and is linked with the coast by a six-inch pipe-line.

China Metal Production.—In the first ten months of last year, China produced 4000 metric tons of tungsten, 2500 tons of tin, 1500 tons of lead and 480 tons of antimony.

Canadian Aluminium for Germany.—Some 3000 tons of pure aluminium have recently arrived at Bremen from Canada, and have been despatched to the British zone of Germany. A further 3000 tons will follow shortly. The bulk is to be used in the electro-chemical industry.

Safeguarding South African Uranium.—Because considerable uranium resources have been found in South Africa, the Governor-General of the Union (Major Van Zyl) stated last week that these discoveries would " call for close Government control of exploitation and disposal," and a Bill for this purpose would be introduced.

U.S.A. Pays More for Chilean Nitrate.—One of the most important basic chemicals, sodium nitrate, is to cost more in the U.S.A. because the Chilean Nitrate Sales Corporation has increased its prices to $44.50 per ton for bulk quantities, and $48 per ton for 100-lb. bags. It is expected that this development will influence prices of other basic nitrogen compounds.

New Benzol Supply.—The first shipment of benzol, a by-product of the coke ovens at the Volta Redonda steel works, delivered by the Cia Siderurgica Nacional, consigned to Shell-Mex Brazil, Ltd., recently arrived at Rio de Janeiro in two railway tank-cars each with a capacity of 45,000 litres. It is estimated that production in 1948 will total 2½ million litres.

Sudan to Produce Edible Oils?—In view of the present world shortage of fats and oils, the Sudan is becoming increasingly interested in the possibilities of producing large crops of groundnuts, palm kernels and cotton seeds, all of which yield edible oils. The provision of suitable transport facilities, fertilisers and plant is therefore to be investigated, and considerable research into soil and climatic conditions undertaken.

Worthless U.S. Diplomas.—*Indian Information* 21, No. 218, contains an official Indian Government statement that it will not recognise diplomas and degrees issued by the International University of Delaware, the Chartered University of Huron, the National University of Colorado, and the Charitable University of Delaware. This information is given " in view of the fact that large numbers of Indians will be interested in obtaining U.S. qualifications."

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

REYNOLDS SCIENTIFIC GLASS WORKS, LTD., London, S.W. (M., 24/1/48.) December 19, mortgage, to National Provincial Bank, Ltd., securing all moneys due or to become due to the bank; charged on 9 The Broadway, Wimbledon, and plant, machinery, etc.

TOWNSON & MERCER, LTD., Croydon, manufacturers of chemical apparatus, etc. (M., 24/1/48.) December 18, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on Holmwood, Beddington Lane, Beddington, and land adjoining. *£13,237. September 12, 1947.

COPPER & ALLOYS, LTD., West Bromwich. (M., 24/1/48.) December 19, further charge and transfer of charge (supplemental to a charge dated July 19, 1940, and supplemental charges dated March 26, 1942, etc.), to Rothschild Nominees, Ltd., further increasing the limit secured by charge dated July 19, 1940, and deeds supplemental thereto from £80,000 to £180,000; general charge. *£80,000. July 16, 1947.

Satisfaction

PARK ROYAL SCIENTIFIC INSTRUMENTS, LTD., London, W.C. (M.S., 24/1/48.) Satisfaction December 22, £1500, registered November 3, 1944.

Company News

The nominal capital of **Distillers Co. (Biochemicals), Ltd.,** Fleming Road, Speke, near Liverpool, has been increased beyond the registered capital of £100 by £999,900 in £1 ordinary shares.

Benn Brothers, Ltd., publishers of THE CHEMICAL AGE, has declared the following dividends, less tax, payable on February 14: 3 per cent on the preference shares for the half-year ended December 31, 1947, and interim dividend of 5 per cent on the ordinary shares (same).

The nominal capital of **Egyptian Chemical & Drug Industries, Ltd.,** 52 Bedford Square, London, W.C.1, has been increased beyond the registered capital of £40,000 by £10,000 in £1 shares.

Crystalate, Ltd., announces a net profit for the year ended September 30, 1947, of £21,082 compared with £13,251 in the previous year. A dividend of 7½ per cent (6 per cent in the previous year) has been recommended.

The nominal capital of **B.E.F. Tools, Ltd.,** manufacturers of plastic, modelling and moulding materials, tools, etc., 988 London Road, Leigh-on-Sea, has been increased beyond the registered capital of £1500 by £1500 in £1 ordinary shares.

The nominal capital of **De La Rue Insulation, Ltd.,** manufacturers of plastics, etc., Imperial House, 84/86 Regent Street, London, W.1, has been increased beyond the registered capital of £300,000 by £1,200,000 in £1 ordinary shares.

New Companies Registered

Compentrad Chemical Products and Supplies, Ltd. (447,759).—Private company. Capital £100. Manufacturers of chemical products, drugs, etc. Reg. office: 31 Throgmorton Street, E.C.2.

Trifolium, Ltd. (447,976).—Private company. Capital £1000. Processors of waste products, growers, manufacturers and factors of organic manures, artificial manures and fertilisers, etc. Directors: W. Scott and A. Fileman. Reg. office: Brink Top Farm, Mytholmroyd, Yorks.

Chemical and Allied Stocks and Shares

ALTHOUGH in most sections the volume of business has been quite well maintained, there has been an attitude of caution in stock markets, probably due to the reassembly of Parliament. This applied mainly to industrial shares which recorded small irregular movements with buyers coming in on any decline in price. In contrast with further declines in 2½ per cent Consols and Treasury Bonds, dated gilt-edged stocks again strengthened, and this tended to have a steadying influence on other sections of markets.

Imperial Chemical eased to 51s. at which there is a yield of 3¾ per cent on the basis of the 10 per cent total distribution which is generally expected to be held. It is being assumed that the group benefits considerably from the end of E.P.T. which will be reflected in results for 1947, but that

the directors are unlikely to increase the dividend unless there are reasonable prospects of maintaining the higher rate. B. Laporte were 88s. 9d., and W. J. Bush 83s. 9d., while there was again activity around 70s. in Fisons. British Chemicals and Biologicals 4 per cent preference strengthened to 22s., reflecting hopes of an increase in the forthcoming dividend, Borax Consolidated were 56s. 3d., Monsanto Chemicals were 65s., Boake Roberts firm at 34s., and Greeff-Chemicals Holdings 17s. 3d. Shares of companies with plastics interests became more prominent, with British Xylonite £8, Lacrinoid Products 2s. shares around 6s. 9d., and British Industrial Plastics 9s. 1½d., while Erinoid 5s. ordinary were 16s. 3d. Elsewhere, British Glues & Chemicals 4s. ordinary have been firm at 24s.

Yield considerations brought in renewed support for iron and steel shares, United Steel improving to 29s. 4½d., Dorman Long to 29s. 6d., and John Summers to 33s. 6d., while Firth Brown rallied to 71s. 3d. Partly because of hopes that the London Metal Exchange may be re-opened this year, Amalgamated Metal shares further improved to 20s. Imperial Smelting were 22s. 6d., and Metal Traders 51s. 3d. Head Wrghtson further improved to 53s. 9d., the company being among those making equipment for both the colliery and oil industries. In other directions, Turner & Newall eased to 84s. 4½d., but United Molasses have been steadier at 53s. 3d., and the units of the Distillers Co. 30s. 6d. British Oxygen were 99s. 4½d., and in other directions, Glaxo at £23½ lost part of an earlier improvement. British Drug Houses 5s. shares at 12s. 6d. have been favoured on the possibility of further expansion in export trade and the knowledge that financial results should benefit materially from the end of E.P.T. Paint shares have been firm, aided by the news that shares of further companies are likely to be introduced to the Stock Exchange in the near future. Lewis Berger were £8¾, and International Paint £7¾. Goodlass Wall strengthened to 40s. 7½d., and Pinchin Johnson to 61s. 6d.

Boots Drug rallied to 60s. 3d., Griffiths Hughes were 40s. 7½d., Sangers 35s. 3d., Timothy Whites 44s. 6d., and Beechams 2s. 6d. deferred changed hands around 22s. 9d. General Electric rallied to 92s. 3d., and English Electric to 55s. 3d. In other directions, De La Rue were 47s. 6d. Gas stocks and shares strengthened further on the assumption that current market prices are likely to prove undervaluations if the Nationalisation Bill provides a fair compensation basis. Oils were prominent under the lead of Anglo-Iranian, which rallied on the latest news from India, and touched £9½ at one time. V.O.C. improved and the new Shell shares (£1 paid) were 41s. 3d.

British Chemical Prices

Market Reports

ACTIVE conditions are again reported from the industrial chemicals market. Export inquiry remains persistent while the demand for the chief home consuming industries continues steady with delivery specifications covering good volumes There has been a good demand but relatively short supplies of the soda products particularly for soda ash and caustic soda. Among the potash chemicals there has been a good market for the B.P. and technical grades of permanganate of potash, and offers of yellow prussiate, caustic and carbonate of potash are quickly taken up. Formaldehyde continues in good call, and there has been no falling off in the demands for acetone, acetic acid, arsenic and glycerine. The lead oxides are in active request at the new rates, and the demand for paint raw materials generally is strong. The tone throughout the market is very firm, and there appears little likelihood of any early change in the position. There have been no alterations in the coal-tar products market, and the volume of new business is more or less dictated by the supply position.

MANCHESTER.—Strong price conditions continue to be reported in virtually all sections of the Manchester chemical market. Home trade call for deliveries of soda ash, caustic soda, sulphide of sodium and most other soda compounds has been a prominent feature and plenty of additional business has been on offer, both for industrial consumers at home and on export account. In the fertiliser market, many descriptions are being taken up in satisfactory quantities and the trade in this section is likely to grow steadily during the coming weeks. Most varieties of tar products, both light and heavy, are meeting with a steady demand and outputs of pitch, creosote oil, carbolic acid and benzol, in particular, are being fully absorbed.

GLASGOW.—In the Scottish heavy chemical market business during the week has been fairly brisk and generally there has been an improved tone. All classes of chemicals have been in good demand and available supplies have been fully taken up. In the export market there has been a distinct improvement and more orders than usual have been booked. There are indications that the new trade agreements are being effective and that more settled conditions are likely to prevail. Bleaching powder has been in very heavy demand but supplies are extremely inadequate.

Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Method of improving the first- and heat-resistance of materials and compositions for use therein.—Albi Chemical Corporation. May 22, 1946. 13630/1947.

Moulded or laminated asbestos products and method of producing same.—American Cyanamid Co. May 15, 1946. 11428/1946.

Process for the production of an alkali metal ferricyanide.—American Cyanamid Co. March 2, 1940. 21810/1947.

Aliphatic olefins and manufacture thereof.—California Research Corporation. May 21, 1946. 10141/1947.

Manufacture of tetrahalogen-ethyl compounds of improved stability.—C.I.B.A., Ltd. May 17, 1946. 12886-7/1947.

Manufacture of 3 : 4 dichloro-1- tetrachlorethylbenzene.—C.I.B.A., Ltd. May 17, 1946. 12888/1947.

Manufacture of organosilicon amines.—Corning Glass Works. May 16, 1946. 9622/1947.

Method of removing chlorate substances from alkali metal hydroxide.—Diamond Alkali Co. May 23, 1946. 9974/1947.

Chlorinated polymers.—E.I. Du Pont de Nemours & Co. May 17, 1946. 13214/1947.

New polymerisable compositions and polymers thereof. —E.I. Du Pont de Nemours & Co. May 21, 1946. 13636/1947.

Method of preparing rubbery vulcanisable polymeric materials.—B. F. Goodrich Co. May 23, 1946. 13379-80 1947.

Method of preparing rubbery vulcanisable polymeric materials.—B. F. Goodrich Co. May 23, 1946. 13381-3/ 1947.

Mixed allyl ethers of starch.—R. Hamilton and E. Yanovsky. March 25, 1946. 22031/1947.

Process for the manufacture of saccharosonic acids.— F. Hoffmann-La Roche & Co., A.G. May 23, 1946. 13626-7/1947.

Polymerisation of vinyl compounds.—W. P. Hohenstein. Jan. 17, 1946. 20608/1947.

Preparing congo red salt of streptomycin.—Merck & Co., Inc. May 16, 1946. 11539/1947.

Methods and apparatus for cracking hydrocarbons.— M. B. Miller & Co., Inc. May 21, 1946. 13005/1947.

Method for alkylating polystyrene.—Monsanto Chemical Co. May 15, 1946. 7971/1947.

Mineral oils and process of treating same.—Monsanto Chemical Co. May 15, 1946. 9699/1947.

Process of recovering antibiotic substances produced by micro-organisms, particularly penicillin.—M. Stern. May 21, 1946. 7271/1947.

New calciferol esters and their process of preparation.— Usines Chimiques des Laboratoires Francais. May 23, 1946. 11999/1947.

Production of antibiotic agents.—Abbott Laboratories. June 13, 1946. 14134/1947.

Condensation products of ethylene oxide with organic carboxylic amides and method of producing same.— American Cyanamid Co. June 18, 1946. 14535/1947.

Methods of and plant for producing magnesium powder. —American Electro Metal Corporation. June 8, 1946. 14804/1947.

Melamine resins.—British Industrial Plastics, Ltd June 7, 1946. 37587/1946.

Demethylation of methylbenzenes.—California Research Corporation. June 10, 1946. 14326/1947.

Seleno fatty acids and salts and esters thereof.— California Research Corporation. June 11, 1946. 14691-4/1947.

Methods of oxidation of hydrocarbons and the products resulting therefrom.—Clark Bros. & Co., Inc. June 8, 1946. 14293/1947.

Partial oxidation of hydrocarbons.—Clark Bros. & Co., Inc. June 13, 1946. 14384/1947.

Synthetic drying oils and method of production.— Hercules Powder Co. June 11, 1946. 6040/1947.

Polychloro dicyclopentadiene.—Hercules Powder Co. June 13, 1946. 9468/1947.

Process for the manufacture of aryl stibonic acids.— F. Hoffmann-La Roche & Co., A.G. June 14, 1946. 11883/1947.

Cold exchangers.—Hydrocarbon Research, Inc. June 12, 1946. 14869/1947.

Processes in which an alpha, beta-unsaturated ketone is caused to act upon another material under conditions such that inversion of the alpha, beta-unsaturated ketone is a competing reaction.—Koppers Co., Inc. June 4, 1946. 30024/1946.

Pharmaceutical preparations.—Merck & Co., Inc. June 7, 1946. 12314/1947.

Chemical process.—Merck & Co., Inc. June 8, 1946. 12315-6/1947.

Processes of producing agglomerated sodium hexametaphosphate and the improved product resulting therefrom.—Monsanto Chemical Co. June 7, 1946. 9975/1947.

Methods of preparing resinous condensation products and the improved compositions resulting therefrom.— Monsanto Chemical Co. June 12, 1946. 13227-8/1947.

Methods of preparing 7-hydroxysterols and esters.— Philips' Gloeilampenfabrieken. June 7, 1946. 14788/ 1947.

Method of recovering acid in the production of cyclonite.—Honorary Advisory Council for Scientific and Industrial Research. Dec. 30, 1944. 11982/1945.

Manufacture of thiazyl dithiocarbamates.—Sharples Chemical, Inc. June 12, 1946. 15117/1947.

Process for preparing a polyvinyl acetal resin and the polyvinyl acetal resin resulting from the said process.— Shawinigan Resins Corporation. June 12, 1946. 12604/ 1947.

Polyamide condensation polymers.—Wingfoot Corporation. June 5, 1946. 34565/1946.

Linear polyamide condensation products.—Wingfoot Corporation. June 7, 1946. 37251/1946.

Polyamide resins.—Wingfoot Corporation. June 5 1946. 865/1947.

Surface-active compositions and method of producing same.—American Cyanamid Co. May 27, 1946. 9972/1947.

Regeneration of natural or synthetic rubber.—Bata, Narodni Podnik. April 20, 1946. 18539/1947.

Process of obtaining barium carbonates.—G. & W. H. Corson, Inc. April 30, 1946. 11641/1947.

Process of treating barium and strontium sulphates.— G. & W. H. Corson, Inc. April 30, 1946. 11642/1947.

Process for the treatment of complex lithium compounds.—G. & W. H. Corson, Inc. April 30, 1946. 11643/1947.

Process of producing alkali and alkaline earth metals.— G. & W. H. Corson, Inc. May 27, 1946. 13965/1947.

Aqueous dispersions of polymers.—E.I. Du Pont de Nemours & Co. May 24, 1946. 13880/1947.

Addition agent for treating molten ferrous metal.— Electro Metallurgical Co. May 18, 1946. 29777/1946.

Alloy addition agent and method of incorporating alloying elements into molten ferrous metal.—Electro Metallurgical Co. May 18, 1946. 29778/1946.

Alloys of nickel and molybdenum and structural elements and equipment made from the improved alloy.— Indiana Steel Products Co. May 4, 1946. 23246/1946.

Methin dyes containing an isoquinoline nucleus and photographic emulsions containing them.—Kodak, Ltd. May 25, 1946. 13725/1947.

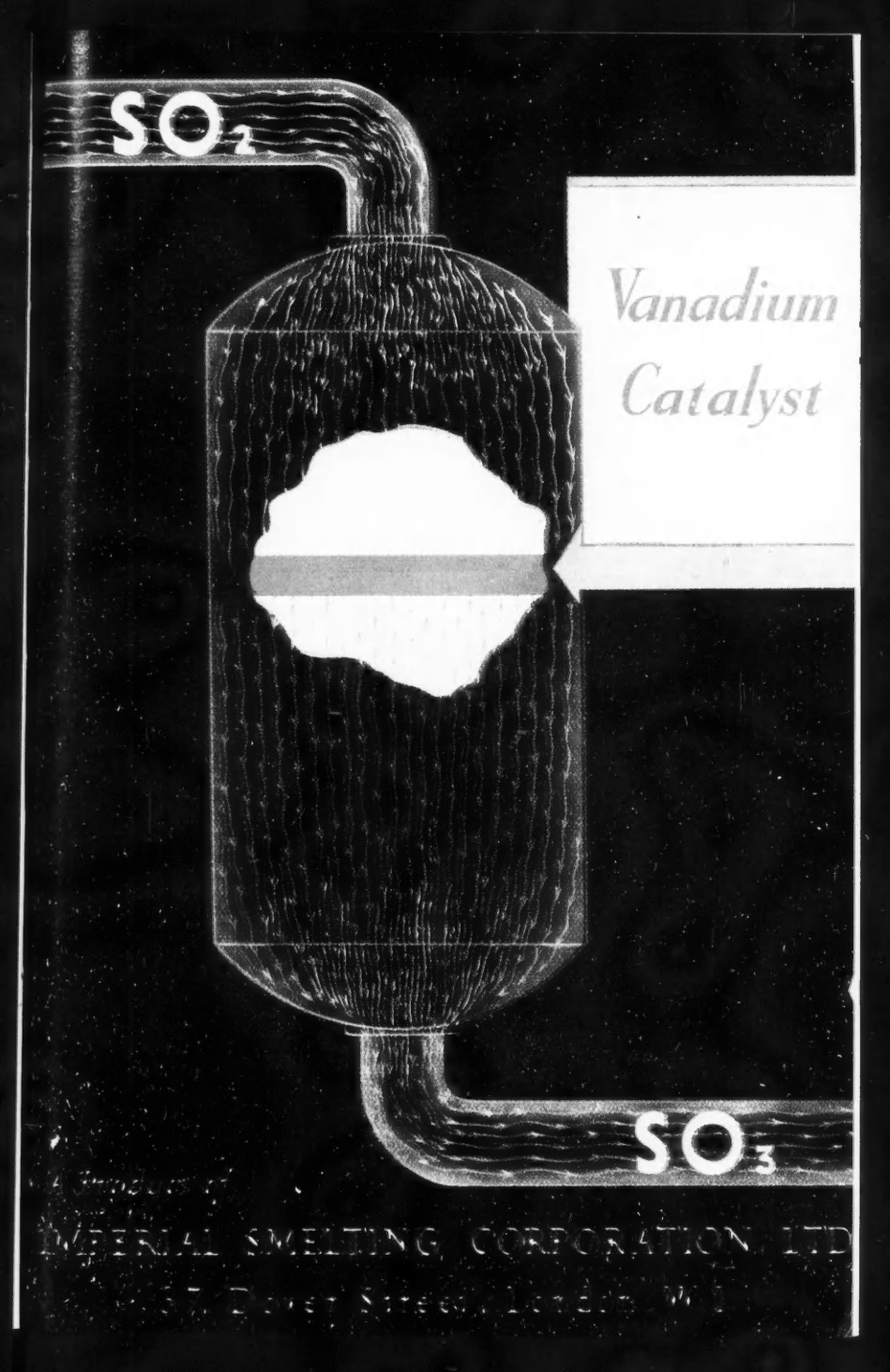
Electrolyser, in particular for producing oxygen compounds for chlorine.—Krebs & Co. A.G. May 27, 1946. 13990/1947.

Gelification of oils.—G. Passelecq. April 19, 1946. 11185/1947.

Fractionation of free fatty acids.—Pittsburgh Plate Glass Co. May 17, 1940. 30209/1947.

Reduction of metal oxides.—R. Planiol. June 27, 1945. 17459/1947.

Magnetic separation.—R. Planiol. Sept. 21, 1945. 17460/1947.



Ester resins.—Bakelite Corporation. May 28, 1946. 1327/1947.

Process for the condensation of sulphonic acids.—L. Bolgar. Feb. 5, 1946. 30711/1947.

Automatic oil burners of the oil pressure atomising type.—Gilbert & Barker Manufacturing Co. May 24, 1946. 23697/1946.

Production of polymeric material. B. F. Goodrich Co. Oct. 21, 1941. 23429-30/1947.

Process for the production of organic compounds.—Houdry Process Corporation. May 31, 1946. 13401-3/1947.

Production of amines.—Imperial Chemical Industries Ltd. May 28, 1946. 14163/1947.

Process for the production of iron powder.—International Mineral & Chemical Corporation. Aug. 17, 1945. 10389/1947.

Method of producing zirconium.—W. J. Kroll. May 28, 1946. 2522/1947.

Organic compounds and method of obtaining same.—Parke, Davis & Co. May 1, 1945. 10090/1946.

Organic compounds and method of obtaining same.—Parke, Davis & Co. July 2, 1945. 13203/1946.

Separation of metacresol from paracresol.—Reilly Tar & Chemical Corporation. July 5, 1943. 30718/1947.

Separation of paracresol from metacresol.—Reilly Tar & Chemical Corporation. Oct. 20, 1943. 30719/1947.

Production of ammonium sulphate.—Semet-Solvay Co. May 28, 1946. 10385/1947.

Process for treatment of gas.—Semet-Solvay Co. May 28, 1946. 10386/1947.

Process for the production of solid compounds of pyridin-β-carboxylic acid diethylamide.—Narodni Podnik. Oct. 14, 1940. 30483/1947.

Production of therapeutic products for use in the preparation of vitamins or vitamin-like substances.—Abbott Laboratories. Oct. 22, 1943. 17489/1945.

Bodied drying oils and processes of preparing same.—American Cyanamid Co. March 6, 1942. 5499/1943.

Olefinic nitriles.—American Cyanamid Co. June 6, 1942. 20020/1945.

Alkylene cyanohydrins and method of producing same.—American Cyanamid Co. June 4, 1946. 13096/1947.

Colloidal aqueous dispersions and methods of preparing same.—American Cyanamid Co. May 23, 1946. 20039/1947.

Dry hydrogen chloride.—Bay Chemical Co., Inc. Dec. 10, 1940. 31371/1947.

Manufacture of organosiloxanes.—Corning Glass Works. Feb. 26, 1942. 14108/1946.

Preparation of tocopherol concentrates.—Distillation Products, Inc. May 31, 1946. 25906/1946.

Production of organohalosilanes.—Dow Corning Corporation. June 6, 1946. 14705/1947.

Production of organohalosilanes.—Dow Corning Corporation. June 6, 1946. 14706/1947.

Polymerisation of esters of methacrylic acid.—E.I. Du Pont de Nemours & Co. May 29, 1946. 14307/1947.

New polymerisable compounds and polymers thereof.—E.I. Du Pont de Nemours & Co. May 29, 1946. 14308/1947.

Production of organic chlorine compounds.—E.I. Du Pont de Nemours & Co. May 29, 1946. 14309/1947.

Process and apparatus for the production of melamine.—E.I. Du Pont de Nemours & Co. March 27, 1946. 31685/1947.

Processes for the preparation of hydrocyanic acid from alkaline cyanides and alkaline-earthy cyanides.—Montecatini Soc. Generale per L'Industria Mineraria e Chimica. Jan. 13, 1944. 31435/1947.

Electrolytic production of chlorates.—Pennsylvania Salt Manufacturing Co. June 5, 1946. 13590/1947.

Process for the manufacture of new disazo dyestuffs.—Sandoz, Ltd. May 29, 1946. 14190/1947.

Production of biguanide compounds.—Soc. Des Usines Chimiques Rhonepoulenc. May 28, 1946. 37775/1946.

Separation of water-soluble oxygen-containing compounds from a mixture containing water.—Texaco Development Corporation. June 1, 1946. 14053-57/1947.

Production of polyolefinic hydrocarbons.—Universal Oil Products Co. May 31, 1946. 21352/1947.

Preparation of disubstituted barbituric and thiobarbituric acid derivatives.—Winthrop Chemical Co., Inc. Aug. 23, 1943. 9124-5/1944.

Japan's Chemical Industry

Review of Progress Report No. 23

ACCORDING to Summation No. 23, the latest available report issued by General MacArthur's headquarters, the production index figure for Japan's chemical industry in July rose to a new record level of 48 per cent of estimated requirements for a "minimum balanced economy."

Less Calcium Superphosphate

Owing to slow deliveries of raw materials, production of calcium superphosphate dropped to 58,496 metric tons, *i.e.*, 13 per cent less than June. To some extent, however, this was offset by a 12 per cent increase in ammonium sulphate production to 75,820 metric tons. While this was regarded as satisfactory, coal and coke deliveries were too erratic to permit such a level to be maintained. Calcium cyanamide output (25,000 metric tons) was practically unchanged, while carbide production increased by 1200 metric tons to about 35,000 tons.

With regard to sulphuric acid, 128,631 metric tons were produced in July; this compares with the revised figure of 124,120 metric tons for June. Stocks declined by some 10,000 tons to 58,000 at the end of the month, *i.e.*, a ten-day supply. The situation is not expected to improve until more pyrites are produced and transport difficulties solved.

Better Coal Allocations

Increased coal allocations were responsible for post-war record output in the soda industries, caustic soda aggregating 4795 metric tons (17 per cent higher than in June, and 20 per cent of the estmated needs of the country). Manufacture of soda ash rose from 1920 metric tons in June to 4178. Production of domestic salt amounted to about 12,000 metric tons compared with some 10,000 in the previous month.

Output of coal-tar, coal-tar products, and crude benzene rose as a result of larger quantities of coal being coked. Ethyl alcohol production fell from 1087 kilolitres to 740, because five large plants ceased operations owing to breakdown of equipment, while that of acetone amounted to 43 metric tons. There was a small increase in dyestuffs production.

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